THE GRADUATE SCHOOL

ANNOUNCEMENTS 1965-66

WEST VIRGINIA UNIVERSITY BULLETIN

YEAR 1965

JANUARY

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YEAR 1966

JANUARY

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ON THE COVER: *Memorial Plaza–featuring the mast of the U.S.S. West Virginia.*

ANNOUNCEMENTS OF

THE GRADUATE SCHOOL

1965-66 SESSION

WEST VIRGINIA UNIVERSITY BULLETIN

West Virginia University

Morgantown

Established February 7, 1867

The Board of Governors

	Term Expires
Okey B. Glenn, *President,* Williamson	1968
Charles C. Wise, Jr., *Vice-President,* Charleston	1969
Albert B. C. Bray, Jr., *Secretary,* Logan	1972
Raymond E. Salvati, Huntington	1965
Forrest H. Kirkpatrick, Wheeling	1966
James H. Swadley, Jr., Keyser	1967
Ralph J. Bean, Moorefield	1970
K. Douglas Bowers, Beckley	1971
William G. Thompson, Montgomery	1973

Paul A. Miller, *Chief Executive Officer,* Morgantown

The Board of Governors has charge of the educational, administrative, financial, and business affairs of the University and Potomac State College of West Virginia University.

West Virginia University Bulletin
Series 65, No. 6-3, December, 1964
Entered as second-class matter July 15, 1929, at the post office in Morgantown, W. Va., under the Act of August 24, 1912.
Issued Monthly

CONTENTS

UNIVERSITY CALENDAR

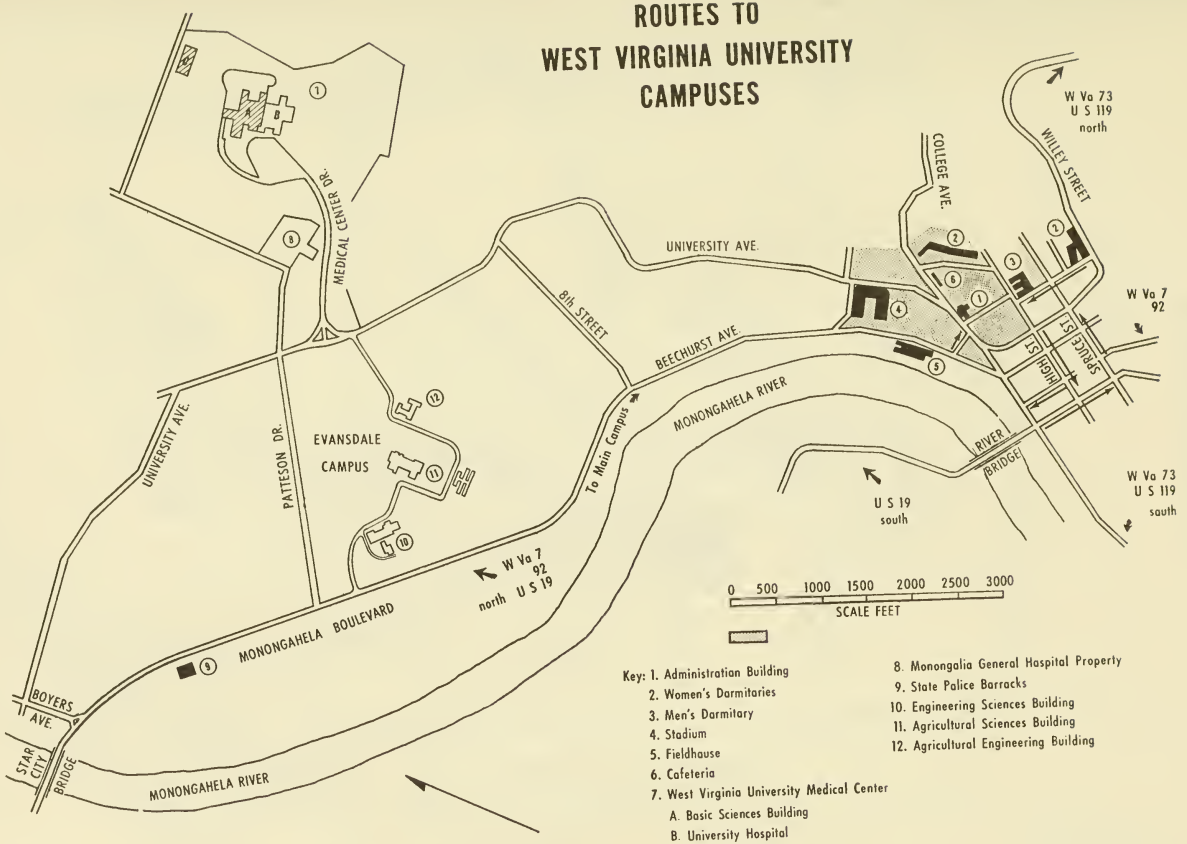
1965

May 29, Saturday — Alumni Day
May 30, Sunday — Baccalaureate Exercises
May 31, Monday — Commencement
June 14, Monday — Registration for Summer Session
June 15, Tuesday — First Classes, Summer Session
July 14, Wednesday — English Proficiency Examination
August 21, Saturday — Close of Summer Session
September 9, Thursday, to September 12, Sunday, incl. — Freshman Orientation
September 9 and 10, Thursday and Friday — General Registration, First Semester
September 11, Saturday — Freshman Registration
September 13, Monday — First Classes, First Semester
October 7, Thursday — English Proficiency Examination
October 12, Tuesday — Meeting of University Senate
November 1, Monday — Mid-semester Reports Due
November 24, Wednesday, to November 28, Sunday, incl. — Thanksgiving Recess
December 18, Saturday noon, to January 2, Sunday, incl. — Christmas Recess

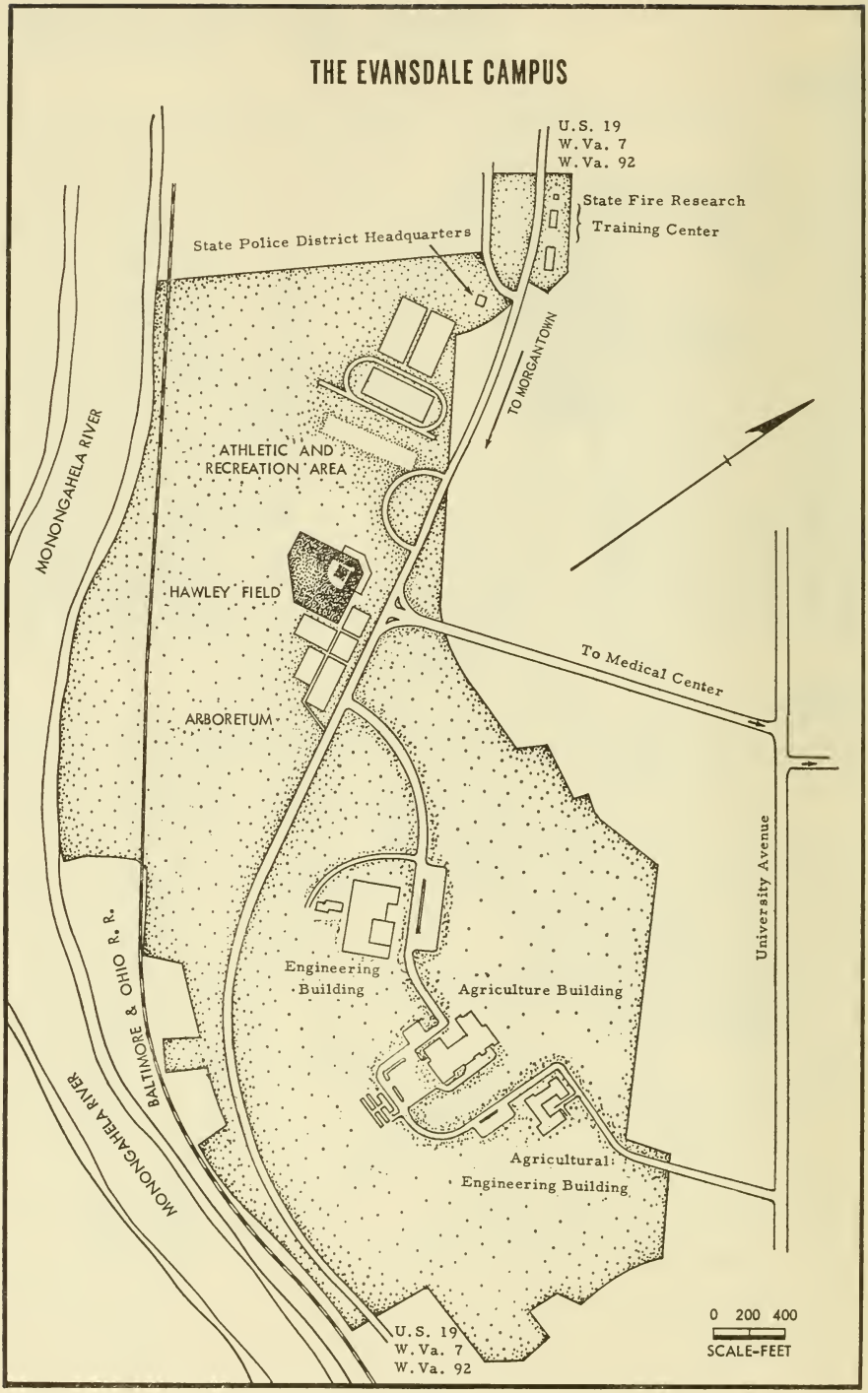
1966

January 15, Saturday — Last Classes, First Semester
January 17, Monday to January 22, Saturday, incl. — Final Examinations for First Semester
January 28 and 29, Friday and Saturday — General Registration for Second Semester
January 31, Monday — First Classes, Second Semester
February 7, Monday — West Virginia University Day
February 8, Tuesday — Meeting of University Senate
February 17, Thursday — English Proficiency Examination
March 28, Monday — Mid-semester Reports Due
April 8, Friday, to April 11, Monday, incl. — Easter Recess
May 10, Tuesday — Meeting of University Senate
May 16, Monday — Last Classes, Second Semester
May 18, Wednesday, to May 24, Tuesday, incl. — Final Examinations, Second Semester
May 25, Wednesday — Grade Reports for Graduating Seniors and Graduate Students due in Deans' Offices
May 26, Thursday — Dean's Reports of Graduates due in Registrar's Office
May 28, Saturday — Alumni Day
May 29, Sunday — Baccalaureate Exercises
May 30, Monday — Commencement

ROUTES TO WEST VIRGINIA UNIVERSITY CAMPUSES



Key:
1. Administration Building
2. Women's Dormitories
3. Men's Dormitory
4. Stadium
5. Fieldhouse
6. Cafeteria
7. West Virginia University Medical Center
   - A. Basic Sciences Building
   - B. University Hospital
   - C. Mechanical Plant
8. Monongalia General Hospital Property
9. State Police Barracks
10. Engineering Sciences Building
11. Agricultural Sciences Building
12. Agricultural Engineering Building


THE EVANSDALE CAMPUS
U.S. 19
W. Va. 7
W. Va. 92
State Fire Research
Training Center
State Police District Headquarters
TO MORGANTOWN
MONONGAHELA RIVER
ATHLETIC AND
RECREATION AREA
HAWLEY FIELD
To Medical Center
ARBORETUM
University Avenue
Engineering
Building
Agriculture Building
BALTIMORE & OHIO R. R.
MONONGAHELA RIVER
Agricultural
Engineering Building
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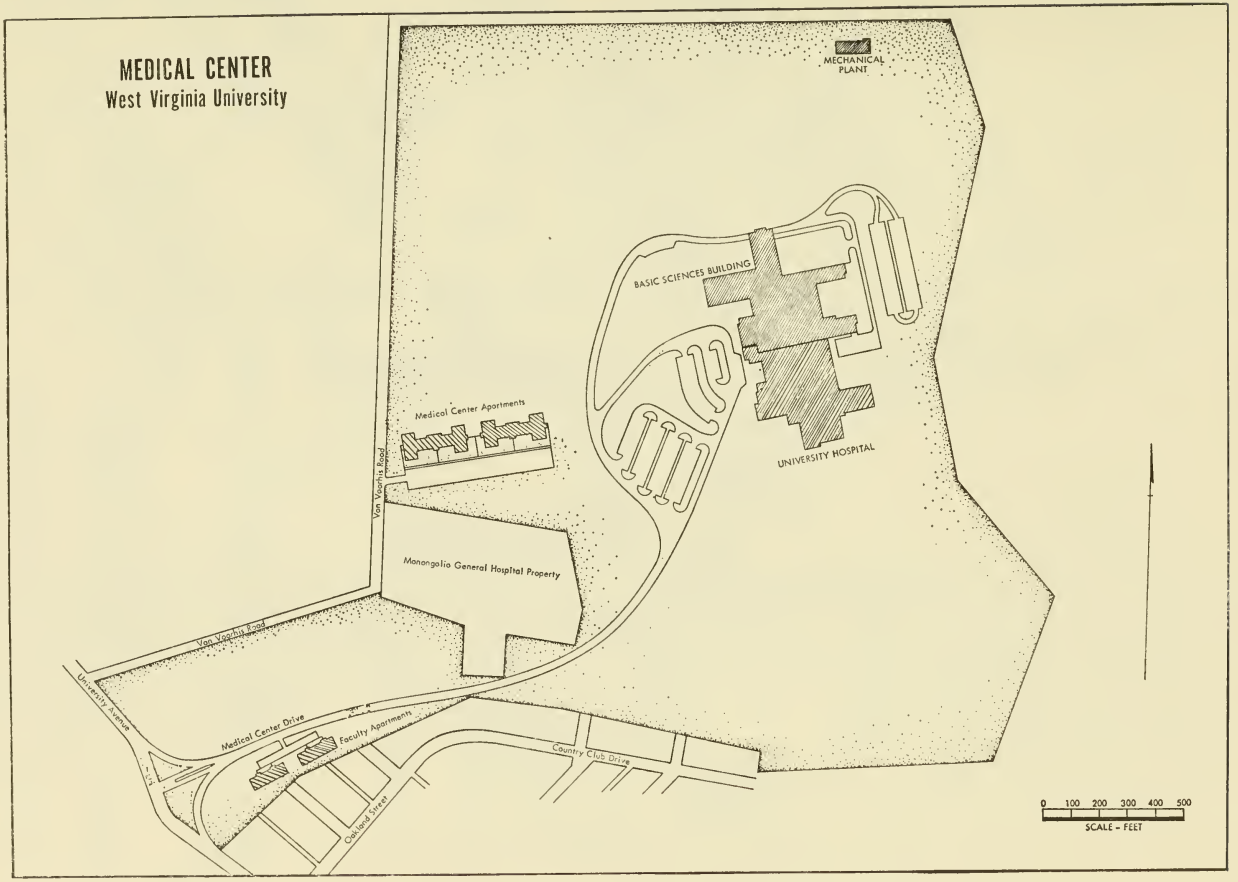
SCALE-FEET


MEDICAL CENTER
West Virginia University
MECHANICAL PLANT
BASIC SCIENCES BUILDING
UNIVERSITY HOSPITAL
Medical Center Apartments
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Monongalia General Hospital Property
Van Voorhis Road
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Medical Center Drive
Faculty Apartments
Country Club Drive
Cleveland Street
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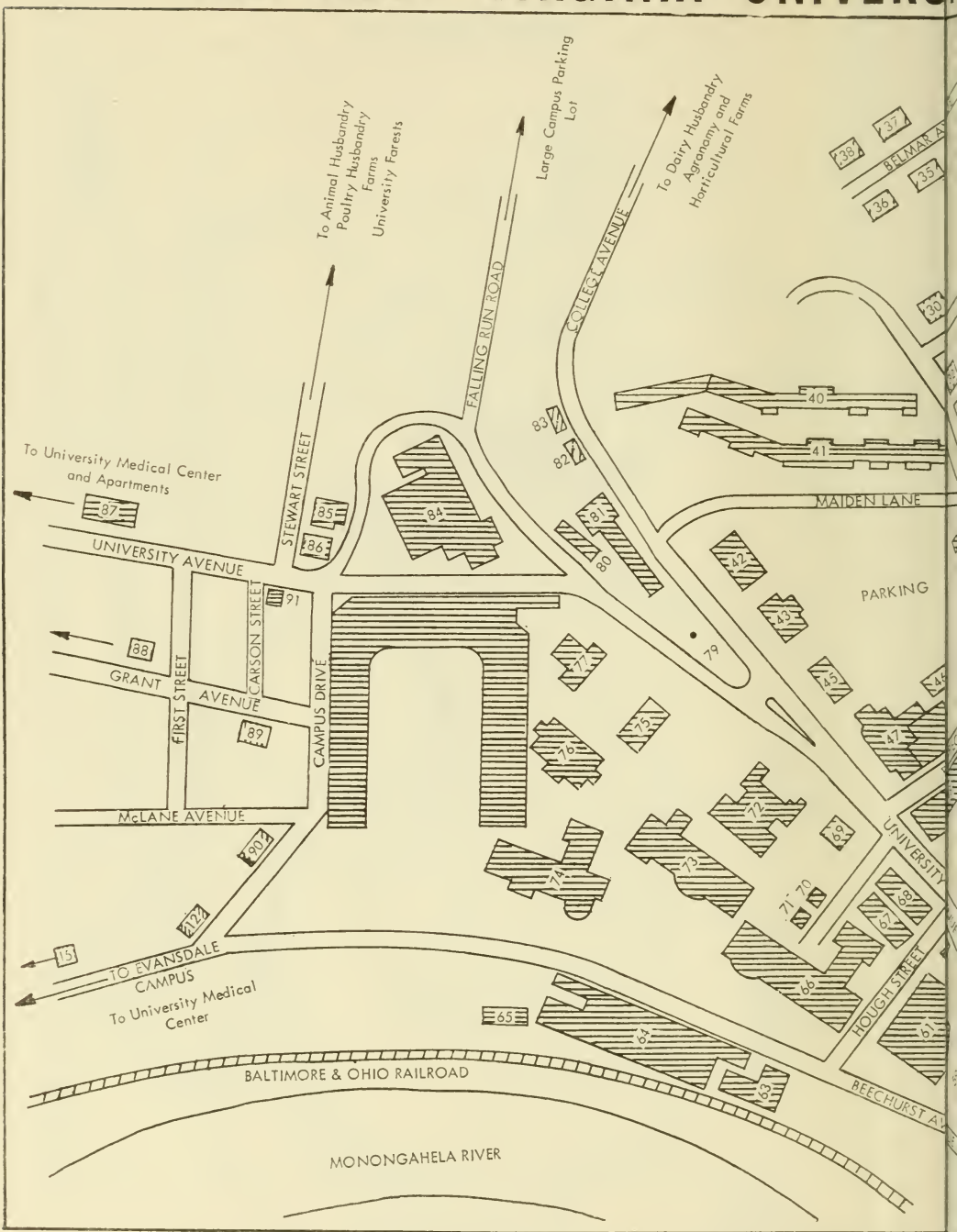
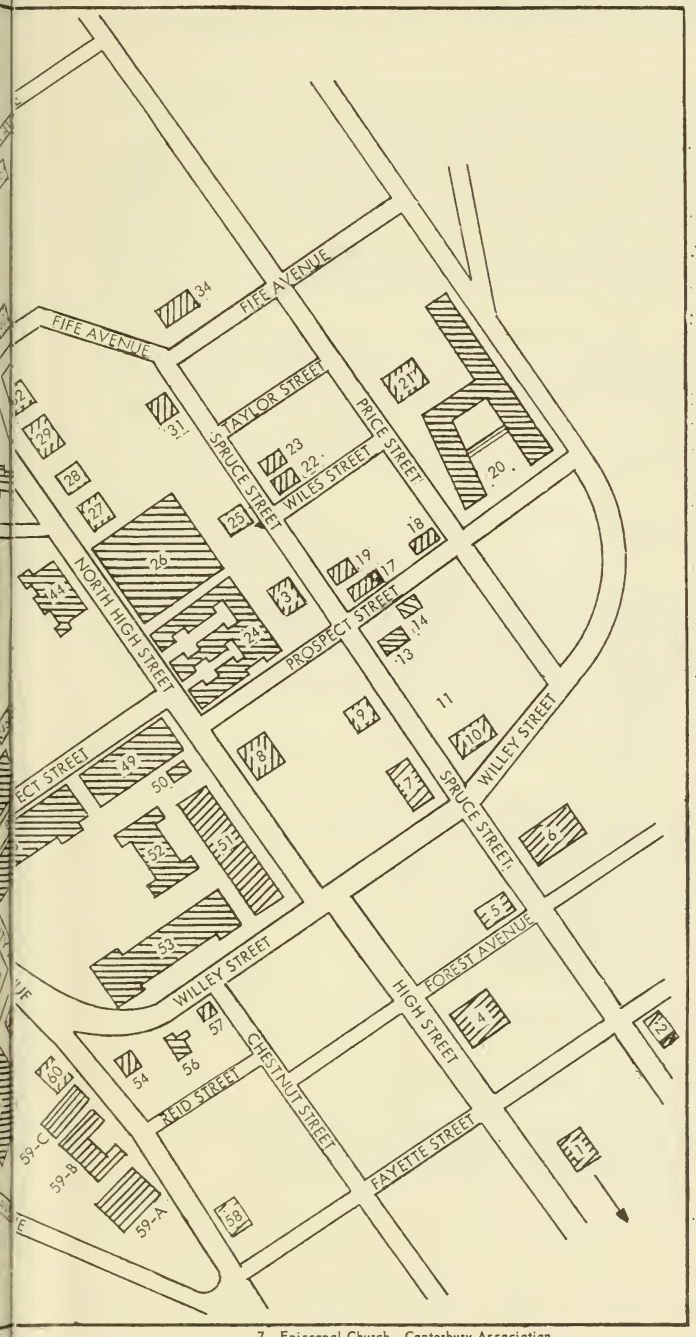
SCALE - FEET

THE WEST VIRGINIA UNIVERS



1. Christian Church – Disciples Fellowship
2. Spruce Street Methodist Church
3. Gamma Phi Beta Sorority
4. Baptist Church Student Fellowship
5. Greek Orthodox Church – Greek Orthodox
6. Presbyterian Church – Westminister Fo

STY MAIN CAMPUS



7. Episcopal Church – Canterbury Associatian
8. Chi Omega Sorority
9. Phi Kappa Sigma Fraternity

10. Alpha Phi Sorority
11. Spruce Street Parking Lot
12. Nursery School
13. Laurel Cottage
14. 284 Prospect
15. Lutheran Church
16.
17. Kappa Kappa Gamma Sorority
18. Alpha Delta Pi Sorority
19. Alpha Xi Delta Sorority
20. Arnold Hall Residence and Apartments
21. Delta Gamma Sorority
22. Delta Delta Delta Sorority
23. Alpha Phi Delta Fraternity
24. Gov. Arthur I. Boreman Hall, South
25. Theta Chi Fraternity
26. Gov. Arthur I. Boreman Hall, North
27. Delta Tau Delta Fraternity
28. Kappa Alpha Fraternity
29. Phi Sigma Kappa Fraternity
30. Sigma Chi Fraternity
31. Phi Sigma Delta Fraternity
32. Tau Kappa Epsilon Fraternity
33.
34. Phi Kappa Psi Fraternity
35. Sigma Nu Fraternity
36. Kappa Sigma Fraternity
37. Beta Theta Pi Fraternity
38. Phi Delta Theta Fraternity
39.
40. Terrace Hall
41. Woman's Hall
42. Cafeteria
43. Health Center
44. Armory
45. Reynolds Hall
46. Speech Annex
47. Administration Building
48. Chemistry Building
49. Engineering Building No. 1
50. Faculty Club House and University Extensia
51. Methodist Church – Wesley Foundation
52. Library
53. Mineral Industries Building
54. Kappa Delta Sorority
55.
56. Home Management House
57. Alpha Sigma Phi Fraternity
58. Jewish Youth Center – Hillel Foundation
59-A St. Theresa Catholic Church
59-B Newman Hall (Catholic youth group)
59. C St. John's Chapel
60. Pi Beta Phi Sorority
61. Music Building
62. Lutheran Student Association
63. Industrial Arts
64. Field House
65. Heating Plant
66. Physics Building
67. Bookstore
68. Law Building
69. President's Home
70. Counseling Center
71. Placement Office
72. Elizabeth Moore Hall
73. Armstrong Hall
74. Brooks Hall
75. Martin Hall
76. Woodburn Hall
77. Science Hall
78. Mountaineer Field
79. U.S.S. W.Va. Mast
80. Oglebay Hall Annex
81. Oglebay Hall
82. Residence Housing Office
83. 721 College Avenue
84. Mountainlair
85. Plant Pathology Greenhouse
86. Forestry Building
87. Evangelical United Brethren Church – Student Youth Fellowship
88. Alpha Gamma Rho Fraternity
89. Lambda Chi Alpha Fraternity
90. Pi Kappa Alpha Fraternity
91. Industrial Arts Annex

ADMINISTRATIVE OFFICERS

GENERAL

President, Paul Ausborn Miller, B.S.Agr., M.A., Ph.D., LL.D., (1962), 1938.
Provost, John Ford Golay, A.B., M.A., D.Phil.(Oxon), (1961).
Vice President—Medical Center, Kenneth Earl Penrod, B.S., Ph.D., (1959).
Vice President—West Virginia Center for Appalachian Studies and Development, Ernest Joseph Nesius, B.S.A., M.S.A., Ph.D., (1963), 1960.
Vice President—Administration and Finance, Harry Bruce Heflin, A.B., A.M., Ph.D., (1964).
Comptroller and Director of Business Affairs, Louise Keener, B.A., (1954), 1929.
Registrar, Stanley Robert Harris, A.B., M.S., (1963), 1953.
Director of Admissions and Assistant Provost, David Norman Hess, A.B., B.D., M.A., Ph.D., (1963).
Director of Libraries, Robert Ferguson Munn, A.B., M.A., Ph.D., (1957), 1952.
Director of Student Affairs, Joseph Clay Gluck, B.A., B.D., (1948), 1943.
Dean of Women, Betty Boyd, A.B., (1955), 1948.
Director of Development, Donovan Hiner Bond, B.S.J., M.A., (1959), 1946.
University Marshal, Sam Boyd, Jr., B.F.A., M.F.A., (1959), 1943.

COLLEGES, SCHOOLS, AND DIVISIONS

Agriculture, Forestry, and Home Economics, Robert Standish Dunbar, Jr., Ph.D., *Dean,* (1964), 1952.
Agricultural Experiment Station, A. H. VanLandingham, Ph.D., *Director,* (1959), 1929.
Arts and Sciences, Carl Maynard Frasure, Ph.D., *Dean,* (1961), 1927.
Commerce, Thomas Corwith Campbell, Jr., Ph.D., *Dean,* (1964), 1948.
Creative Arts Center, Richard Edward Duncan, Ph.D., *Dean and Director,* (1964), 1958.
Dentistry, Kenneth Vincent Randolph, D.D.S., *Dean,* (1958), 1957.
Education, Earl Ruffner Boggs, Ph.D., *Dean,* (1960).
Engineering, Chester Abbo Arents, M.E., *Dean,* (1955).
Engineering Experiment Station, James Albert Kent, Ph.D., *Associate Director,* (1963), 1958.
Graduate, John Ford Golay, D.Phil.(Oxon.), *Dean,* (1961).
Joseph Kyle Stewart, Ph.D., *Assistant Graduate Dean* (1963), 1930.
Journalism, Quintus Charles Wilson, Ph.D., *Dean,* (1961).
Law, Paul Lambert Selby, Jr., LL.B., *Dean,* (1964).
Medicine, Clark Kendall Sleeth, M.D., *Dean,* (1961), 1935.
Mines, Charles Thomas Holland, M.S.E.M., *Dean,* (1961), 1930.
Nursing, Dorothy Mae Major, Ed.D., *Dean,* (1960).
Pharmacy, Raphael Otto Bachmann, Ph.D., *Dean,* (1961).
Physical and Health Education, Recreation, and Safety, Ray Oscar Duncan, Ed.D., *Dean,* (1952).
Air Force R.O.T.C., Lt. Col. Jan Walter Janssen, B.S., *Head,* (1964), 1962.
Army R.O.T.C., Col. Edwin Wendell Reynolds, B.S., *Head,* (1962).

HEADS OF OTHER ADMINISTRATIVE OFFICES

Alumni Association, David Wood Jacobs, A.B., *Executive Secretary,* (1938).
Book Store, Ruth Eleanor Robinson, A.M., *Manager,* (1944), 1939.
Computer Center, Albert Estern Drake, Ph.D., *Director,* (1963).
Institute of Biological Sciences, Edward George Stuart, Ph.D., M.D., *Director,* (1964).
Department of Radio, Television, and Motion Pictures, C. Gregory Van Camp, A.B., *Director,* (1960).
Health Service, John Joseph Lawless, Ph.D., M.D., *Director,* (1944), 1935.

NOTE: The first date following titles indicates latest appointment. The second date indicates year of first appointment to a University position.

High School, University, Delmas Ferguson Miller, Ph.D., *Director,* (1960), 1949.
E. Grant Nine, M.S., *Principal,* (1960), 1956.
Housing, Robert Allen Robards, B.S.B.A., *Coordinator,* (1964), 1960.
Intercollegiate Athletics, Robert Nathan Brown, A.B., *Director,* (1954), 1950.
Kanawha Valley Graduate Center, Walter Hamilton Walker, Ph.D., *Director,* (1960).
Mountainlair, Robert Francis McWhorter, M.S., *Director,* (1959).
Nursing Service, Audrey Edith Windemuth, M.S., *Director,* (1961), 1960.
Parkersburg Branch, Billy Lee Coffindaffer, Ph.D., *Director,* (1964), 1950.
Personnel, S. Thomas Serpento, M.A., *Director,* (1964), 1960.
Physical Plant, Clifton Wharton Flenniken, Jr., B.S., *Director,* (1961).
Placement, Margaret Cornelia Ladwig, Ph.D., *Adviser,* (1949).
Residence Halls, Agnes Berdelia Hovee, M.A., *Director,* (1956), 1950.
University Hospital, Eugene Leo Staples, M.S., *Director,* (1960).
University Publications, John Luchok, B.S.J., *Editor,* (1953), 1950.
News and Information Services, William Paul Criswell, B.S.J., *Director,* (1964).
Veterans Affairs and University Scholarships, Neil Eugene Bolyard, M.A., *Coordinator,* (1963).
West Virginia Center for Appalachian Studies and Development
Cooperative Extension Service, Ernest Joseph Nesius, Ph.D., *Director,* (1963), 1960.
Extension, University, Roman Joseph Verhaalen, Ph.D., *Dean,* (1964).
Research and Development, Office of, John Charles Ludlum, Ph.D., *Director,* (1963), 1946.

GRADUATE SCHOOL EXECUTIVE COMMITTEE

John Ford Golay, D.Phil. (Oxon.), *Chairman.*
Joseph Kyle Stewart, Ph.D., (ex officio) *Assistant Graduate Dean.*
Arthur Stephen Pavlovic, Ph.D., *Associate Professor of Physics.*
Hugh Alexander Lindsay, Ph.D., *Associate Professor of Physiology.*
James Hamilton Schaub, Ph.D., *Professor of Civil Engineering.*
Delmas Ferguson Miller, Ph.D., *Professor of Education.*

Part I
GENERAL INFORMATION

HISTORY

West Virginia University was founded as a result of the Congressional Land-Grant (Morrill) Act of July 2, 1862, originally proposed in Congress for the benefit of agriculture and the mechanic arts. The State Legislature accepted conditions of the Act on October 3, 1862. Because of the State's questionable wartime status, the Legislature later specifically requested that the Act's benefits be extended to West Virginia. This was done by Congress on April 19, 1864, with the issuance of 150,000 acres in land scrip for public tracts, principally in Iowa and Minnesota.

The trustees of Monongalia Academy, on January 9, 1866, offered its property to the State, including the site and other property of nearby Woodburn Female Seminary, appraised at $51,000, on condition that the proposed college "be located permanently at or near Morgantown." The Legislature accepted the offer February 7, 1867, and established the "Agricultural College of West Virginia."

Government and control of the "Agricultural College" were vested in a Board of Visitors composed of one member from each of the State's eleven senatorial districts. In response to requests from President Alexander Martin, the Legislature, by an act of December 4, 1868, changed the name of the "Agricultural College" to "West Virginia University." At the same time the name of the controlling body was changed from "Board of Visitors" to "Board of Regents." Primarily to serve political purposes, the number of regents was changed from time to time until 1919, when government and control were vested in a State Board of Education of five members, including the State superintendent of free schools as the ex officio chairman. This plan was unsatisfactory, and an act of April 14, 1927, vested control of the University's academic matters in a Board of Governors of seven members. In 1947, the Board was increased to nine members, and made responsible for both academic and financial affairs of the University.

Right up to the end of the century, supporters of the institution were divided on whether to work for a "State-supported University," or a "first-class State-supported college." Until the early 1890's the "College Plan" dominated, with "departments" and "schools" functioning autonomously, and with professors generally occupying "chairs" and operating provincially.

But the Hatch Act (1887) and the Second Morrill Act (1890) stimulated more progressive thinking among leaders in higher education. Many of them who were familiar with European systems (including the University's President James L. Goodknight) helped bring the "University Plan" into the ascendancy. In 1895 President Goodknight set out to convert the "University" into just that.

ORIGIN OF THE SCHOOLS AND COLLEGES

The eight Academy Schools, five Technical and Professional Schools, and four Special Courses were organized into four colleges, each with a dean: Arts and Sciences, Powell B. Reynolds; Engineering and Mechanic Arts, William S. Aldrich; Agriculture, John A. Meyers; and Law, Judge Okey Johnson. The School of Music was established in 1897, a "Summer Quarter" or "Continuous Session" in 1898, and a College of Medicine in 1900.

Both the College of Medicine and the Summer Quarter were discontinued in 1901. Beginning in 1897 the College of Arts and Sciences and the College of Engineering and Mechanic Arts functioned without deans and through more or less autonomous departments and schools to 1911 when the deanships were revived. In 1902 a semblance of the "Summer Quarter" was revived in the "Summer School,"

which in 1932 became the "Summer Session." Alternating between a department and a school organization since 1867, Military Science and Tactics became a division in 1911. The arrangement made in 1903 with the College of Physicians and Surgeons, Baltimore, for maintaining a University College of Medicine proved unsatisfactory. It was discontinued in 1910, and the "Medical Sciences" were offered in a department of the College of Arts and Sciences to 1912 when the School of Medicine was established. In 1914 a Department of Pharmacy was established in the School of Medicine. In the same year the Department of Home Economics, previously a unit in the College of Arts and Sciences, was transferred to the College of Agriculture. The Division of Agricultural Extension was organized in 1912 and the Division of Mining and Industrial Extension in 1914.

The building program inaugurated in 1917 brought additional expansions and curricular offerings. Among the former were the Engineering Experiment Station, 1921, and the School of Mines, 1926, which in 1930 became an independent unit. In 1927 the courses in education were transferred from the College of Arts and Sciences to the newly created College of Education, and in 1928 the Division of Physical Education was established. Offerings were being improved meanwhile through additional and better-qualified personnel. In January, 1930, the Board of Governors established a Graduate School authorized to offer graduate degrees in certain indicated fields.

The Depression (1929-35) slowed expansion somewhat, but progress was resumed in 1936 when the Department of Pharmacy was discontinued as a unit of the School of Medicine and converted to the College of Pharmacy. The next year the Division of Physical Education and the Department of Athletics were combined into the School of Physical Education and Athletics. At the same time (1937), the course in Forestry, begun in 1935 as a two-year curriculum in the College of Agriculture, was expanded to a four-year course, and the name of the sponsoring unit was changed to the College of Agriculture, Forestry, and Home Economics. In 1939 the Department of Journalism was discontinued as a unit in the College of Arts and Sciences and became the School of Journalism. The same year a Department of Art was established in the College of Arts and Sciences. In 1940 the College was further enlarged by the inclusion of a Department of Social Administration, authorized to offer a graduate curriculum leading to the professional Certificate of Social Work. In 1941 the name was changed to the Department of Social Work and in 1944 the Department was authorized to establish an undergraduate curriculum in social work leading to the Bachelor of Science degree.

In 1950 the Board of Governors authorized the degree of Master of Social Work and approved the establishment of a two-year curriculum leading to that degree. In 1944 a four-year course leading to the B.S. (Medical Technology) Degree was approved to be given jointly by the College of Arts and Sciences and the School of Medicine. In 1948 the Board of Governors approved an order authorizing the College of Arts and Sciences to offer a general course as an integral part of its curriculum and an optional lower-division program of general studies. In 1951, the Department of Economics and Business Administration was discontinued as a unit in the College of Arts and Sciences and converted into the College of Commerce. In 1953 the School of Dentistry was established. In 1958, the College of Pharmacy was reconverted into the School of Pharmacy, marking the integration of the School into the University's expanding medical sciences program. The University's Kanawha Valley Graduate Center of Science and Engineering was established at Institute, with the first classes beginning in September of 1958. In 1961 it was changed to Kanawha Valley Graduate Center of West Virginia University. In 1960 the School of Physical Education and Athletics was changed to the School of Physical and Health Education, Recreation, and Safety. In 1960 the School of Nursing was established.

The West Virginia Center for Appalachian Studies and Development was established in 1963 in order to identify, regroup, and to set into coordinated purposeful action those major activities which relate the University to the State and the Appalachian Region.

In 1964 the School of Music was combined with the Department of Art and the Drama section of the Department of Speech to form the Creative Arts Center. In 1964 the Institute of Biological Sciences was organized to coordinate the biological studies of the various schools and colleges of the University.

PRESIDENTS OF THE UNIVERSITY

The University has had fifteen regular presidents, eleven acting presidents, and one chairman of the faculty. Together with their periods of service, they were Alexander Martin, April 3, 1867-August 12, 1875; Vice-president John Work Scott (acting), September 6, 1875-March 27, 1877; John Rhey Thompson, March 28, 1877-March 12, 1881; Vice-president Daniel Boardman Purinton (acting), March 13, 1881-1882; William Lyne Wilson, 1882-1883; Robert Carter Berkeley (Chairman of the faculty), 1883-1885; Eli Marsh Turner, 1885-July 21, 1893; Vice-president Powell Benton Reynolds (acting), July 24, 1893-1895; James L. Goodknight, 1895-August 6, 1897; (from August 6 to August 19, 1897, Vice-president Robert Allen Armstrong was nominally acting president); Jerome Hall Raymond, August 10, 1897-1901; Powell Benton Reynolds (acting), March 21, 1901-July 31, 1901; Daniel Boardman Purinton, August 1, 1901-July 31, 1911; Alexander R. Whitehill (acting), August 1, 1911-September 30, 1911; Thomas Edward Hodges, October, 1911-August 31, 1914; Frank Butler Trotter (acting), July 9, 1914-1916; 1916-1928; John Roscoe Turner, 1928-December 31, 1934; Robert Allen Armstrong (acting), January 1, 1935-September, 30, 1935; Chauncey Samuel Boucher, October 1, 1935-August 31, 1938; Charles Elmer Lawall (acting), September 1, 1938-1939; 1939-August 31, 1945; Charles Thompson Neff, Jr., (acting), September 1, 1945-1946; Irvin Stewart, 1946-August 24, 1958; Clyde Lemuel Colson (acting), August 26, 1958-January 31, 1959; Elvis Jacob Stahr, Jr., February 1, 1959-January 25, 1961; Clyde Lemuel Colson (acting), January 26, 1961-December 31, 1961; Paul Ausborn Miller, January 1, 1962.

THE PHYSICAL PLANT

West Virginia University's Main Campus comprises 74.35 acres near the center of Morgantown. Its Evansdale campus, about one and one-half miles northwest of the Main Campus, consists of approximately 260 acres and was acquired in 1948. This campus is the site of the buildings of the Colleges of Agriculture and Engineering, occupied in the Spring of 1961. In 1951, the Monongalia County Court deeded to the University approximately 85 acres of land adjoining 55 acres already owned by the University. This 140-acre tract, about one and one-half miles north of the Main Campus, is the site of the University Medical Center. In 1960 the University acquired 58.05 additional acres in the area across a road from the Medical Center Mechanical Plant. This acreage is adjacent to 3 acres bequeathed to the University. The first building of the Center, the Mechanical Plant, was completed in 1954. The Basic Sciences Building was open for classes in September, 1957. Construction was completed on the University Hospital in December, 1959.

Much of the Main Campus is on high ground overlooking the Monongahela River and the surrounding countryside. The physical plant includes 49 state-owned buildings or structures on campus, five demonstration and experimental farms near Morgantown, four additional experimental farms and two Cooperative Extension centers located at suitable points throughout the State, a summer surveying camp for civil and mining engineering students, and a summer camp for forestry and biological science students. A new women's dormitory, Arnold Hall, was put into use in September, 1957, and an addition to Men's Hall, accommodating 250 students, was completed in September, 1959.

In the summer of 1961 completion of a large housing project provided 188 apartments for faculty, staff, and students at the Medical Center, as well as 276 dormitory spaces for women students and 86 apartments for faculty, staff, and students on the Main Campus.

In 1964 work was started on a new Forestry Building on the Evansdale Campus with provision for extensive wood technology laboratories. The twin-towers dormitory to house 900 students was started the same year, and the University acquired the Reeder residential property adjacent to the Evansdale Campus to serve as a new home for the president.

LOCATION

The main campuses of the University are in Morgantown, Monongalia County, 80 miles southeast of Wheeling and 200 miles north of Charleston. The community is served by the Baltimore and Ohio Railroad (limousine service between Morgan-

town and Grafton), Lake Central Airlines, thirty truck systems and five bus lines, and W. Va. Routes 7, 73 and 92, and U. S. Routes 19 and 119. Morgantown is located on the Monongahela River, 72 miles south of Pittsburgh, Pa. Half of the population of the United States is within 500 miles of Morgantown.

ACCREDITATION

West Virginia University is a member of the North Central Association of Colleges and Secondary Schools. It is accredited by the North Central Association and various accrediting agencies.

ORGANIZATION

Operating Funds

Funds for operating the University's various divisions are derived from the following sources: (1) interest on the land-grant endowment of $129,600; (2) annual appropriations by the Legislature; (3) Federal Morrill-Nelson and Bankhead-Jones funds; (4) student activities fees; (5) Hatch Act, Amended; (6) Agricultural Extension Consolidated; (7) tuition of high school students paid by Monongalia County Board of Education; (8) income derived from sale of farm and dairy products, as well as income from athletics, dormitories, dining halls, book store, student activities, hospital clinics, etc; (9) grants by Federal agencies for special research and extension projects; (10) contributions by private benefactors for the support of scholarships, loan funds, and prizes, and (11) revenues from the State soft-drink tax dedicated to the establishment of a medical center for teaching and research in medicine, dentistry, nursing, and medical technology.

Government

Direction of educational, administrative, financial, and business affairs of the University is vested in the Board of Governors. The board is bipartisan and consists of nine members who are appointed by the Governor with staggered terms of service.

The University year is divided into two semesters of approximately eighteen weeks each and a Summer Session of ten weeks.

Acting in an advisory capacity to the President and assisting him in carrying out established University policies is a *Council of Administration,* composed of the President, the Provost, the Vice-presidents, the Registrar, the Comptroller, and the deans of all colleges and schools, as well as other administrative officers who may be requested to take part in the deliberations of the Council.

The *University Senate,* a legislative body with jurisdiction over all academic matters that concern the entire University and all matters that concern more than one college or division, is composed of the President, the Provost, the Vice-presidents, the Registrar, all professors, associate professors, and assistant professors in all colleges, schools, and divisions, and all chairmen of departments.

The *Graduate Faculty,* composed of all members who teach courses on the graduate level, sets the specific requirements and standards of quality for admission to candidacy for graduate degrees and for the awarding of graduate degrees.

The *Committee on Student Affairs* acts as an integral part of the whole organization of the University. Its program is bound up with that of the University as a whole and is designed to serve the larger academic and social objectives of modern education.

Colleges and Schools

The components of the University, together with dates of establishment of the various colleges and schools, etc., follow:

Colleges: College of Arts and Sciences, 1895; College of Law, 1895; College of Engineering and Mechanic Arts, 1895 (changed to College of Engineering in 1960); College of Agriculture, 1895; College of Education, 1927; College of Pharmacy (changed to the School of Pharmacy in 1958), 1936; and the College of Commerce, 1952.

Schools: School of Music, 1897; the Summer Quarter, 1898-1900, Summer School, 1902-1931, and Summer Session, 1932; School of Medicine, 1912; School of Mines, 1926; Graduate School, 1930; School of Physical Education and Athletics, 1937, (changed to School of Physical and Health Education, Recreation and Safety, 1960); School of Journalism, 1939; School of Dentistry, 1953; School of Pharmacy (formerly the College of Pharmacy), 1958; and School of Nursing, 1960.

Divisions: Division of Military Science and Tactics, 1911; Division of Military and Air Science and Tactics, 1949; Division of Military Science and Tactics and Air Science, 1955; Division of Military Science and Air Science, 1960; Division of Home Economics, 1937; and the Division of Forestry, 1937.

Experiment Stations and Research Bureaus: Agricultural Experiment Station, 1888; Engineering Experiment Station, 1921; Government Research Bureau, 1931-1935; Bureau for Government Research, 1949; and the Bureau of Business Research, 1949.

Extension Service: Agricultural Extension (Cooperative Extension 1961), 1912; Mining and Industrial Extension, 1914; Education Extension, 1915; Liberal Arts Extension, 1916; University Extension, 1930; and the Institute of Industrial Relations, 1956.

The College of Agriculture, Forestry, and Home Economics; the College of Arts and Sciences; the College of Engineering; the School of Music; the School of Mines; the School of Nursing; the School of Physical and Health Education, Recreation, and Safety; the Creative Arts Center; and the Institute of Biological Sciences; are all degree-granting units admitting freshmen. The College of Education, the College of Commerce, the College of Law, the School of Dentistry, the School of Journalism, the School of Medicine, and the School of Pharmacy are professional colleges and schools requiring from two to three years of academic training as a foundation for professional work. All graduate instruction is administered by the Graduate School through the Graduate Faculty.

LIVING ACCOMMODATIONS

The University maintains seven residence halls, two for men and five for women. For information as to accommodations and rates, address the Director of Residence Halls.

The Off-Campus Housing Adviser is an assistant to the Director of Student Affairs. His office is located at the University Housing Center, 719 College Avenue. This office will provide information regarding private housing in Morgantown and vicinity. All graduate women students and men students requiring living accommodations in private residences, apartments, or houses may write or call upon the Housing Adviser for assistance. Private housing off-campus is available at reasonable rates and is within easy walking distance of the campus. A few private residences are equipped to board students.

The University operates several hundred furnished and unfurnished apartments for students, faculty, and staff at reasonable rates. For information write to the Apartment Housing Office, 719 College Avenue.

HEALTH SERVICE

The University Health Service provides medical care to students of the University and supervises general campus health conditions. The staff includes four full-time and two part-time physicians, seven nurses, two laboratory technicians, and clerical personnel. The University Pharmacy, housed in the Health Center, is managed by the School of Pharmacy. The departments of Pathology and Microbiology cooperates in the laboratory examination of diagnostic materials.

The Health Service occupies the University Health Center, constructed in 1942. This three-story building is centrally located, fronting on College Avenue adjacent to Reynolds Hall. It is built of brick and concrete and is fireproof throughout. On the first floor are the treatment rooms, offices, and pharmacy. The second floor is occupied by laboratory and X-ray departments, and offices for physicians. The third floor contains a well-equipped infirmary.

The Health Service is in operation from 8:00 A.M. to 5:00 P.M. daily except Saturday and Sunday. Saturday hours are 8:00 A.M. to noon. Physicians are in

attendance from 9:00 A.M. to noon and 2:00 P.M. to 4:00 P.M. A nurse is present at all times in the Infirmary, and a University physician can always be reached by calling the Health Service, phone 293-2311.

Each regularly enrolled University student pays a fee which provides for medical consultation and advice from University physicians. Moderate additional charges are made for room calls, X-rays, laboratory tests, minor operations, treatment of fractures, and drugs furnished by the Health Service or Pharmacy.

The Infirmary

Students who need bed care for medical illness are hospitalized in the University Infirmary. The Infirmary is open only to full-time students. It is the policy of the Health Service to have all students requiring such care in the Infirmary. Students hospitalized in the Infirmary are under the care of Health Service physicians, although other qualified physicians may be seen in consultation when necessary. Patients will be admitted and discharged on the order of Health Service physicians.

Upon admission to the Infirmary the student receives two days of hospitalization without charge except for laboratory, X-ray, special medications, and private duty nurse fees. No additional charge is made for general nursing care, dressings, routine medications as commonly supplied by the Health Service, and food as ordered by the physician in charge. Laboratory examinations, X-rays, penicillin, and similar medication will be charged at the usual Health Service rate to students. Special nurses, when necessary, are at the expense of the student.

A student may not receive more than thirty days hospitalization for any one illness. Patients are to leave when discharged by the University physicians. When it becomes evident that a student's illness will be so prolonged as to prevent his completing work of the current semester, he may be discharged from the Infirmary when the attending physician or the Director of the Health Service considers that he may be moved without undue danger to his health. The services as indicated above are subject to the availability of space in the Infirmary. Twenty-two beds at present are ready for use.

Student Insurance

A voluntary insurance plan is available to students to supplement the medical care offered by the Health Service. The plan provides for payment for hospitalization, surgeon, and consultant's fees, and other medical costs throughout the year, both in Morgantown and elsewhere. For cost of this insurance and details concerning coverage see the brochure available at the Health Service.

LIBRARY

The Library provides books and related materials for teaching, research, and cultural purposes. It maintains well-balanced collections in all subject fields included in the University curricula. Although primarily intended to supply the needs of the faculty and students of the University, the collections are available to any resident of West Virginia through the Library Extension Service Department. Facilities are available for the reproduction of material by microfilm, Xerox, and photostat.

The holdings of the University Libraries include 520,000 books and government documents, 34,000 maps, 8,500 reels of microfilm and over 50,000 technical reports. The bulk of this material is housed in the General Library. The other major collections are the Agriculture-Engineering Library (37,000 volumes), the Law Library (65,000 volumes), and the Medical Center Library (61,000 volumes). Some 5,000 periodicals are received currently. The Library is a depository for United States Government publications.

The West Virginia Collection, located in the General Library, contains over three million manuscripts, papers, and records relating to the history and development of the State. The Audio-Visual Department has some 1,800 educational films and 600 filmstrips, as well as 3,000 recordings.

During regular sessions, except on holidays and vacations, the Library is open from 7:55 A.M. to 11:00 P.M. Monday through Thursday; Friday from 7:55 A.M. to 10:00 P.M.; from 7:55 A.M. to 5:00 P.M. on Saturdays; and from 2:00 P.M. to 10:00 P.M. on Sundays. During the Summer Session the weekday hours are

from 7:55 A.M. to 9:00 P.M.; and only the Reserve Collection is available on Sundays from 2:00 P.M. to 5:00 P.M. During periods when the University is not in session, the hours are from 9:00 A.M. to 5:00 P.M. Monday through Friday; 9:00 A.M. to noon Saturdays; closed all day Sundays and holidays (New Year's Day, Memorial Day, July 4, Tranksgiving Day, and Christmas Day). Changes in scheduled hours are posted in advance.

BOOK STORE

The University operates on each campus a complete book and stationery store where students may purchase books, supplies, and professional equipment needed in connection with their class work.

The Book Store on the Main Campus is located in the Book Store Building, with entrances from both Hunt Street and University Avenue. The Medical Center Branch Book Store is in the Basic Sciences Building, ground floor, across from the snack bar. The Evansdale Campus store is in the Engineering Sciences Building, ground floor, across from the student lounge.

The stores sell new and used textbooks and buy back from students their used textbooks. They stock books other than textbooks in all categories, art prints, general school supplies, office supply items, medical and engineering instruments and supplies, physical education uniforms for men and women, sporting goods, and University imprinted souvenir, gift and wearing apparel merchandise.

CULTURAL ACTIVITIES

The University, through the Committee on Convocations and Public Exercises, provides appropriate and desirable programs for students. The convocations form the basis of the cultural program, but there are others sponsored by various divisions of the University and community.

The University Cultural Series presents a special program of outstanding cultural events during each academic year and summer session, in the area of drama, music, and the dance.

Convocations consist of addresses by distinguished speakers, and musical and other entertainment features of special merit.

During the year students have an opportunity to attend their own legitimate theatre in which plays are presented by the Division of Drama, Creative Arts Center. The University Radio Theatre is an activity of the Department of Speech.

The University Symphony Orchestra concerts, individual recitals, and glee club concerts are sponsored by the Division of Music, Creative Arts Center.

KANAWHA VALLEY GRADUATE CENTER

The Kanawha Valley Graduate Center of Science and Engineering was established at Institute, W. Va., in 1958. The name was changed to the Kanawha Valley Graduate Center of West Virginia University in 1961. Courses of instruction leading to the master's degree in chemical engineering, chemistry, mechanical engineering, and business administration are available. Requirements for admission to graduate study in the Center and for completion of programs leading to the master's degree are the same as those in effect on the campus at Morgantown. For details of courses, schedules, tuition and fees, prospective students should write to: The Director, Kanawha Valley Graduate Center of West Virginia University, Institute, W. Va.

FELLOWSHIPS AND ASSISTANTSHIPS

Stipends for some of the teaching assistantships listed below will be increased in 1965-66 if funds requested from the State legislature for this purpose are approved. Stipends in Arts and Sciences, Commerce, Journalism, Music, and Physical Education generally range from $1,500 to $2,400, depending on how advanced the appointee is as a graduate student.

Stipends are generally stated in terms of a 9 or 12 months appointment for half-time service, i.e., 20 hours service per week in the case of research assistantships and the teaching of two courses or the equivalent in laboratory assistance in the case of teaching assistantships. Departments may occasionally make appointments for less than half-time service with proportionately reduced compensation.

Assistants giving half-time service are generally advised to take no more than 12 credit hours in any semester. A few departments, indicated below, stipulate a lower maximum credit load.

Applications should be made to the Dean of the College, or, in the case of Arts and Sciences, Engineering, and Medical Sciences, to the Chairman of the Department concerned on or before March 8, 1965.

Agriculture

AGRICULTURAL BIOCHEMISTRY—Research assistantships at $2,400 for 12 months, half-time service, tuition exempt.

Research assistantships at $3,600 for 12 months, three-quarter-time service, maximum credit load 7 hours per semester, tuition exempt. Only candidates with M.S. degree or equivalent are eligible.

AGRICULTURAL EDUCATION—Teaching assistantships at $2,400 for 12 months, half-time service, tuition exempt.

AGRICULTURAL ENGINEERING—Research assistantships at $2,400 for 12 months, half-time service, tuition exempt.

AGRONOMY AND GENETICS—Research assistantships at $2,400 for 12 months, half-time service, tuition exempt.

Teaching assistantship at $2,400 for 12 months, half-time service, tuition exempt.

Research assistantship at $3,600 for 12 months, three-quarter-time service, maximum credit load 7 hours per semester, tuition exempt. Only candidates with M.S. degree or equivalent are eligible.

ANIMAL INDUSTRY AND VETERINARY SCIENCE—Research assistantships at $2,400 for 12 months, half-time service, maximum credit load of 10 hours per semester, tuition exempt.

Teaching assistantships at $2,400 for 12 months, half-time service, maximum credit load of 10 hours per semester, tuition exempt.

HOME ECONOMICS—Teaching assistantships at $2,400 for 12 months, half-time service, tuition exempt.

HORTICULTURE—Research assistantships at $2,400 for 12 months, half-time service, tuition exempt.

Teaching assistantship at $2,400 for 12 months, half-time service, tuition exempt.

PLANT PATHOLOGY, AGRICULTURAL BACTERIOLOGY, ENTOMOLOGY—Research assistantships at $2,400 for 12 months, half-time service, tuition exempt.

Teaching assistantship at $2,400 for 12 months, half-time service, tuition exempt.

Arts and Sciences

BIOLOGY—Teaching assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

CHEMISTRY—Teaching assistantships, $2,400 for 9 months, half-time service, tuition and chemistry fees exempt.

Research fellowships and assistantships supported by contracts and grants from government, private and industrial sources. Stipends comparable to teaching assistantships.

ENGLISH—Teaching assistantships up to $2,000 for 9 months, half-time service, tuition exempt.

FOREIGN LANGUAGES—French, German, and Spanish teaching assistantships up to $2,000 for 9 months, half-time service, tuition exempt.

GEOLOGY—United States Steel Foundation Fellowship at $1,800 for 9 months, family allowance, tuition exempt.

Teaching assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

HISTORY—Teaching assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

MATHEMATICS—Teaching assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

PHYSICS—Teaching assistantships, up to $2,400 for 9 months, half-time service, tuition exempt.

POLITICAL SCIENCE—Departmental assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

PSYCHOLOGY—Psychometric and laboratory assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

SOCIOLOGY—Departmental assistantships up to $2,000 for 9 months, half-time service, tuition exempt.

SPEECH—Teaching assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

Commerce

BUSINESS ADMINISTRATION AND ECONOMICS—Teaching or research assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

INDUSTRIAL RELATIONS—Research assistantships at $1,200 for 9 months, half-time service, tuition exempt.

Education

Research and teaching assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

Engineering

Teaching fellowships in aerospace, chemical, civil, electrical, industrial, materials science, mechanical, and nuclear engineering, and theoretical and applied mechanics, up to $3,800 for 9 months, half-time service, tuition exempt.

Engineering Experiment Station

Research assistantships in aerospace, materials science, chemical, civil, electrical, industrial, mechanical, mining, nuclear, petroleum, and geological engineering, and theoretical and applied mechanics, stipends $125 to $300 per month for 9 or 12 months, half-time service, tuition exempt.

Journalism

Teaching assistantships up to $2,000 for 9 months, half-time service, tuition exempt.

Medical Science

Support from training, research and other grants in biochemistry, gross anatomy, microbiology, microanatomy, pharmacology, and physiology, stipends from $1,800 to $2,400 for 12 months, for students working toward M.S. and Ph.D. degrees.

Music

Teaching assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

Physical and Health Education, Recreation, and Safety

Teaching and research assistantships, up to $2,000 for 9 months, half-time service, tuition exempt.

NSF Fellowships

National Science Foundation Cooperative Graduate Fellowship awards present the opportunity of financial support to graduate students in the fields of the mathe-

matical, physical, medical, biological, and engineering sciences, anthropology, economics, geography, the history and philosophy of science, political science, linguistics, psychology, sociology, and other science fields. The annual stipends are $2,400. Applications are available at the Graduate School Office and must be forwarded to the National Science Foundation by the University on November 2, 1964. National Science Foundation Traineeships in Engineering are available with the same stipends. Applications for these awards should be made directly to the Dean of the College of Engineering.

Oak Ridge Fellowships

The opportunity to participate in the Graduate Fellowship Program of the Oak Ridge Institute of Nuclear Studies is open to qualified graduate students in the fields of biology, chemistry, engineering, mathematics, physics, and other scientific fields. When certified by the University and after completion of his course work, the student has the opportunity to conduct research using the facilities of the Oak Ridge National Laboratory and other Oak Ridge facilities. The basic annual stipend is $3,000 with an allowance of $500 for each dependent. Tenure is for the last year of course work on-campus and/or the final dissertation year at the Oak Ridge National Laboratory. In some cases, graduate students may be offered the opportunity to acquire research through summer appointments at Oak Ridge National Laboratory prior to the time they are qualified to receive a fellowship.

NDEA Title IV Fellowships

The Office of Education under provisions of the National Defense Education Act of 1958, as amended, supports three-year pre-doctoral fellowships in departments which have new or expanded doctoral programs. Information regarding these fellowships may be obtained from the Graduate Office, or by contacting the chairman of the department concerned.

NASA Traineeships

A number of three-year pre-doctoral fellowships in space-related science and technology are supported by grants made by the National Aeronautics and Space Administration. These carry basic stipends of $2,400 plus an allowance of $1,000 for dependents. Selection is made by a local interdisciplinary committee.

Applications for Grants

Proposals prepared by members of the staff for the support of research, for equipment, or facilities, (other than those administered by the Medical Center) are processed by the Graduate Office. It is the responsibility of the person who prepares the proposal to assure the proper format, number of signed and unsigned copies, enclosures, and deadlines. Four additional copies of each proposal must be delivered to the Graduate Office for inter-university files. Letters of transmittal are prepared for the president's signature by the Graduate Office. The Graduate Office files of proposal instructions are available to members of the staff, but each staff member is encouraged to communicate directly with the agency to which the proposal is addressed.

THE SUMMER SESSION

The University holds a summer session of ten weeks duration commencing early in June and ending late in August. Graduate course offerings are arranged to meet the needs of public school and college personnel, as well as regular full-time students.

The requirements for admission and the credits allowed are subject to the same regulations as pertain to the regular academic year. Credit for work completed in summer sessions is equivalent in character to that of the regular year. Credit exclusively obtained in summer sessions may be applied in full to a Master's Degree and in part to the Degree of Doctor of Philosophy or Doctor of Education. Further details concerning the Summer Session may be obtained in the *Summer Session Announcements.*

ADMISSION TO THE GRADUATE SCHOOL

Applicants holding bachelor's degrees from West Virginia University or from other accredited institutions may be admitted to the Graduate School. The application for admission must be filed with the Director of Admissions of the University, who will forward the application to the Dean of the Graduate School and to the department of the student's choice. The applicant must request the registrar of the college or school previously attended to send an official transcript directly to the Director of Admissions. The application and transcript should be received by the Director of Admissions at least one month in advance of registration days. Application forms may be obtained from the Director of Admissions.

Admission to the Graduate School does not constitute acceptance of the student by the major department of his choice as a candidate for a graduate degree. The student will be informed at the time he is admitted to Graduate School of the conditions under which the department will accept him as a degree candidate. These conditions differ by departments and include such requirements as qualifying examinations, periods of satisfactory study in residence, personal interviews, and so on.

Undergraduate deficiencies, generally unsatisfactory background, or lack of adequate facilities in a given department may prevent or delay acceptance by the department. In such instances, the student either must seek acceptance by another department or arrange to make up his deficiencies while enrolled as a special student. Appropriate credits earned prior to acceptance to candidacy will apply to satisfying degree requirements if and when the student later becomes a degree candidate.

Eligible students who wish to further their education without reference to higher degrees may be admitted to the Graduate School as "special graduate students" and may elect courses for which they can satisfy the prerequisites.

The Dean of the Graduate School and the chairman of the department in which the student desires to do his major work will advise him concerning departmental prerequisites for admission, candidacy for an advanced degree, and major and minor advanced degree requirements.

FEES AND EXPENSES

All University fees are subject to change without notice.

A non-refundable special service fee of $10.00 must accompany applications for admission to the Graduate School.

All fees are due and payable at the Comptroller's desk in the Field House Annex (South) on the days of registration. Students must pay fees before registration is accepted and class tickets are released. Completion of arrangements for payment from University payroll checks, officially accepted scholarships, loan funds, grants or contracts shall be considered sufficient for acceptance of registration. Fees paid after regular registration must be paid at the Comptroller's office in the Administration Building. Any student failing to complete registration on regular registration days is subject to the Late Registration Fee of $10.00. Students registering pay the fees shown on page 24, plus special fees and deposits as required.

By order of the Board of Governors, no degree will be conferred upon any candidate prior to payment of all tuition, fees, and other indebtedness to any unit of the University.

Service Charge on Returned Check

A service charge of 5 per cent of the amount of each check returned unpaid by the bank upon which it is drawn shall be collected unless the student can obtain an admission of error from the bank.

If the check returned by the bank was in payment of University and registration fees, the Comptroller's office shall declare the fees unpaid and registration cancelled if the check has not been redeemed within three days from date of written notice. In such a case the student may be reinstated upon redemption of the check, payment of the 5 per cent service charge, and payment of a late payment fee of $10.00.

Special Fees

Late-registration fee (non-refundable)[1]	$ 10.00
Graduation Fee[2]	10.00
Professional Engineering degree (including $10 graduation fee)	25.00
Student's record fee[3]	1.00
Certificate in Home Economics	2.00
Associate in Arts Degree	2.00
Special extra fee for flight training:	
A.E. 171	100.00
A.E. 172	100.00
A.E. 173	100.00
A.E. 181	100.00
A.E. 182	200.00
Fee for change in registration (after 8th day)	1.00
Fee for examination for entrance credit, per unit	1.00
Fee for examination for advanced standing	3.00
Fee for General Educational Development tests (high-school level)[4]	15.00
Certificate of Advanced Study in Education	2.00
Social Work certificate	2.00
Fee for reinstatement of students dropped from the rolls	3.00
Fee for examination of candidates for graduate degree[5]	1.00
Diploma replacement fee	5.00
Physical Education Student Fee	5.00
Student Identification Card Replacement Fee	1.00
Correspondence Course in Guided Reading (per course)	1.00
Driver Education Laboratory Fee	10.00
Labor Education Service (for informal activities)	2.00-10.00
Social Work Field Supervisory Fee (per year)	75.00

Fee for Extension Work

A fee of $12.00 per semester hour is charged for each extension course.

Fees for Undergraduate and Graduate Music Students

Full-time

Resident students	$115.75 per semester
Nonresident students	$380.75 per semester

Part-time

Resident students	$4.00 plus $4.00 per semester hour registration fee.
Nonresident students	$16.00 plus $12.00 per semester hour registration fee.

Full-time or part-time students registered for Bachelors' or advanced degree in Music or the Supervisory Training Program in Music shall pay the regular full-time or part-time tuition and Registration fee for all courses in music. No additional fees are assessed for Applied Music.

[1]This fee is not charged to students who complete registration during the regular registration days as set forth in the University Calendar. This fee became effective September 1, 1960.

[2]The graduation fee is payable by all students at the beginning of the semester or term in which they expect to receive their degrees.

[3]One transcript of a student's record is furnished by the Registrar without charge. This fee is charged for furnishing an additional transcript.

[4]If the applicant applies for admission to and registers in the University within twelve months of the date for his qualifying for the test, a ten dollar credit shall be established for him.

[5]For graduate students not otherwise enrolled at time of final examination.

SEMESTER FEES IN THE COLLEGES AND SCHOOLS

(See Footnotes 6, 7, 8, 9, 10)

	Full Time		Part Time (Per Semester Hour)	
	Resident	Nonresident	Resident	Nonresident
GROUP I Agr., For., and Home Econ. Arts and Sciences Commerce Education Engineering Journalism Mines Music Physical and Health Education, Recreation, and Safety	$65.75* plus Registration Fee of $50.00.	$230.75* plus Registration Fee of $150.00.	$4.00 plus $4.00 per semester hour Registration Fee.	$16.00 plus $12.00 per semester hour Registration Fee.
GROUP II Dental Hygiene Law Medical Technology (Jr. and Sr. Years) Nursing Pharmacy	$80.75* plus Registration Fee of $50.00.	$255.75* plus Registration Fee of $150.00.	$5.00 plus $4.00 per semester hour Registration Fee.	$17.00 plus $12.00 per semester hour Registration Fee.
GROUP III Dentistry Medicine	$142.75* plus Registration Fee of $50.00.	$360.75* plus Registration Fee of $150.00.	$8.00 plus $4.00 per semester hour Registration Fee.	$26.00 plus $12.00 per semester hour Registration Fee.

*Includes Athletics Fee $8; Student Organizations Fee $1.25; Daily Athenaeum Fee $1.50; Health Service Fee $6, (for Dental Hygiene; Medical Technology, junior and senior years; Dentistry and Medicine $9); Mountainlair $4; Student Union Building Fee $3; and Cultural Program Fee $2.

Parkersburg Branch of West Virginia University: $20.00 per semester hour.

Kanawha Valley Graduate Center (Institute, W. Va.): $50.00 per semester hour.

Students registered in other colleges or schools, including the Graduate School, may enroll in class courses in music at the regular full-time or part-time fee per credit hour. These students may also enroll for Applied Music for a maximum of one half-hour lesson per week for one hour credit. The fee for this Applied Music instruction shall be $20.00 in addition to the aforementioned tuition and registration fee. See the University *Catalog* for additional details on fees.

Summer Session Fees

	Resident	*Nonresident*
Tuition, per semester hour (Agriculture, Forestry, and Home Economics; Arts and Sciences; Commerce; Education; Engineering; Journalism; Mines; Music; Physical and Health Education, Recreation, and Safety)	$ 8.00	$28.00
Tuition per semester hour (Dental Hygiene, Law, Medical Technology, Nursing, Pharmacy)	9.00	29.00
Tuition, per semester hour (Dentistry and Medicine)	12.00	38.00
Health Service fee, per term	4.00	4.00
Mountainlair fee, per term	3.00	3.00
Cultural Program fee, per term	1.50	1.50
Student Union Building fee, per term	2.00	2.00

Remission of Fees

Tuition and fees will be remitted to a student registered in the Graduate School or the College of Law who is employed by the University on a regular appointment, subject to the following:

(a) In no case will there be remission of fees payable to State special funds or those charged to special services (see "Special Fees") and flight fees.

(b) Except as provided in "c," a graduate teaching or graduate research assistant will receive remission of tuition and fees commensurate with the hours of service required by the terms of his appointment.

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[6]A full-time student is one who is registered for 12 or more semester hours of work each semester of the regular academic year, or 10 or more semester hours of work during the Summer Session. A full-time student during the regular academic year receives an Identification Card which entitles him to admission to all athletic events. A full-time student during the regular academic year or during the Summer Session is entitled to free medical consultation and advice from the University physician. A moderate charge is made for room calls, X-rays, special laboratory tests, drugs furnished by the University Pharmacy, minor operations, treatment of fractures and dislocations, and intravenous treatment.

[7]A part-time student is one who is registered for fewer than 12 semester hours per semester during the regular academic year, or for fewer than 10 semester hours during the Summer Session.

[8]No person shall be considered eligible to register in the University as a resident student who has not been domiciled in the State of West Virginia for at least twelve consecutive months next preceding college registration. No nonresident student may establish domicile in this State, entitling him to reduction or exemptions of tuition, merely by his attendance as a full-time student at any institution of learning in the State. A minor student whose parents acquire a West Virginia domicile after the student's original registration will be deemed to have the domicile of his parents and become entitled to pay resident fees. Moreover any student who has originally paid nonresident fees may become entitled to pay resident fees, if after an interim of nonattendance or otherwise he has established a valid legal domicile in this State at least twelve months prior to his registration in the University. In any event, the appointment of a guardian for a minor student temporarily resident in West Virginia, other than the designation of a natural guardian, shall not in and of itself operate to establish a West Virginia domicile for such student.

[9]The minimum rate for non-credit courses is that charged for one semester hour of credit.

[10]Athletics Fee, Student Organizations Fee, Daily Athenaeum Fee, Health Service Fee, Mountainlair Fee, Cultural Program Fee, and Student Union Building Fee, all chargeable to Special Services, nonrefundable during this period.

(c) A faculty member on full-time appointment at any recognized institution of higher learning located in West Virginia who is taking a course of graduate study at the University and holds an appointment as a graduate assistant under the terms of Order No. 3071 of the Board of Governors will receive full remission of tuition and fees.

(d) A regular appointment is effective at the beginning of a semester or a summer term. Exemption from tuition and fees must be claimed at the beginning of the registration period or, in the case of a substitute appointment, within ten days after the appointment has been made.

(e) A student who holds a regular University appointment and is eligible for remission of tuition and fees in the second semester of any regular academic year is also eligible for remission of tuition and fees in the summer session immediately following his term of appointment.

Students on regular University appointment who are registered in the Graduate School or the College of Law for twelve credit hours or more in any semester, or for 10 credit hours or more in any summer term, and who qualify for remission of fees, are not subject to the fees payable to State special funds. They are not entitled to the services provided thereby without payment of the appropriate additional fees. Such students do not receive the Student Identification Card which provides for athletic admissions, subscription to the *Daily Athenaeum*, health service, Mountainlair activities, and the cultural program. The student's adviser will issue to him, upon request, a Graduate School identification card which will establish his status as a student for such purposes as using the library, riding University buses, or other University activities which do not require special fees.

The wife (or husband) of any person employed by the West Virginia University Board of Governors for a faculty position with the rank of instructor or above, or for a research position of equivalent rank, or as the administrative head of a University division, or as an assistant administrative head, shall be charged the same fees as resident students. The dependent children of the person so employed shall also be charged the same fees as resident students.

Effective from the date of employment, a full-time employee of West Virginia University shall be charged the same tuition and fees as resident students.

Refunding of Fees

A student who officially withdraws from the University may arrange for a refund of fees by submitting to the University Comptroller evidence of approval of the refund by the Registrar.

To withdraw officially a student must apply to the Registrar for permission. Semester fees will be returned in accordance with the following schedule:

First refund period ending on the second Saturday following the beginning of General Registration.	50% of Athletics Fee, Student Organizations Fee, Daily Athenaeum Fee, Health Service Fee, Mountainlair Fee, Student Union Building Fee, and Cultural Program Fee, all chargeable to Special Services; and all other semester fees less $2.50. (Under no circumstances is the amount retained less than $2.50).
Second refund period ending on the fourth Saturday following the beginning of General Registration.	50% of Athletics Fee, Student Organizations Fee, Daily Athenaeum Fee, Health Service Fee, Mountainlair Fee, Student Union Building Fee, and Cultural Program Fee, all chargeable to Special Services; and 80% of all other semester fees.
Third refund period ending on the sixth Saturday following the beginning of General Registration.	60% of semester fees not chargeable to Special Services.[11]

Last refund period ending on the eighth Saturday following the beginning of General Registration.	40% of semester fees not chargeable to Special Services.[11]

The second Saturday following the beginning of general registration for a semester is the end of the first refund period. The second Saturday following the beginning of general registration for a summer term is the end of the refund period.

The University Board of Governors has ordered that students called to the armed services of the United States be granted full refund of refundable fees, but no credit, if the call comes before the end of the first three-fourths of the term, and that full credit by courses be granted to men called to the armed services of the United States if the call comes thereafter; provided, however, that credit as described above will be granted only in those courses in which the student is maintaining a passing mark at the time of his departure for military service. In the recording of final grades, for three-fourths of a term or more, both passing and failing grades are to be shown on the student's permanent record card.

[11]Athletics Fee, Health Service Fee, Mountainlair Fee, Cultural Program Fee, Student Organizations Fee, Daily Athenaeum Fee, and Student Union Building Fee, all chargeable to Special Services, non-refundable during this period.

Part II
ORGANIZATION AND REGULATIONS

By order of the Board of Governors of West Virginia University, a University Graduate School is established, whose roots are implanted in all University undergraduate work, irrespective of colleges, schools, or departments. The Graduate School is empowered: (1) to direct research and investigation with particular reference to problems of the State, and (2) to train and recommend to the Board of Governors candidates for the degrees listed below.

The Kanawha Valley Graduate Center of West Virginia University, located at Institute, was established in 1958. Courses leading to the master's degree in chemistry, chemical engineering, mechanical engineering, and business administration are available at the Center.

All regulations governing the Graduate School such as the determination of curricula, projects, majors, minors, standards, thesis requirements, and similar matters shall be formulated by the Executive Committee and the Dean of the Graduate School and presented to the Graduate Faculty for its consideration and action.

THE ADVISER

The adviser will arrange a specific course of study to be approved by the Dean and, in the case of candidates for advanced degrees, will preside at the candidate's qualifying and final examination.

THE FACULTY

The Graduate Faculty is composed of those faculty members who are actively assisting with any phase of the graduate program such as teaching graduate courses, directing graduate research, supervising thesis and problem work, advising graduate students and directing their graduate studies. Membership is by appointment by the Dean of the Graduate School following certification by the Executive Committee. The Deans of the various colleges and schools, the Vice President-Medical Center, Vice President-Appalachian Center, the Provost of the University, and the President of the University are members ex officio.

GRADUATE DEGREES

Graduate degrees offered by the departments in the University which have been approved by the graduate faculty follow:

Master of Arts (A.M.) in—

- Art
- Biology
- Classics
- Economics
- Education
- English
- French
- German
- History
- Latin
- Latin American Area Studies
- Library Science
- Mathematics
- Philosophy
- Political Science
- Psychology
- Romance Languages and Literature
- Sociology
- Spanish
- Speech

Master of Science (M.S.) in—

- Agricultural Microbiology
- Agricultural Bacteriology
- Agricultural Biochemistry
- Agricultural Economics
- Agricultural Education
- Agronomy
- Animal Breeding & Genetics
- Animal Nutrition
- Animal Physiology
- Animal Production or Veterinary Science
- Biochemistry (Medical)

Botany
Business Administration
Chemistry
Economics
Entomology
Food Science
Genetics
Geology
Gross and Neurological Anatomy
Horticulture
Industrial Relations
Mathematics
Microanatomy and Organology
Microbiology (Medical Bacteriology)
Pharmacology
Physical Science
Physiology
Physical Education
Physics
Plant Pathology
Poultry Science
Rehabilitation Counseling
Vocational Agriculture
Zoology

Designated Master's Degrees—

Master of Agriculture
Master of Business Administration
Master of Home Economics
Master of Music
Master of Social Work

Master of Science in the following designated fields—

Master of Science in Aerospace Engineering (M.S.A.E.)
Master of Science in Agricultural Engineering (M.S.Ag.E.)
Master of Science in Chemical Engineering (M.S.Ch.E.)
Master of Science in Civil Engineering (M.S.C.E.)
Master of Science in Electrical Engineering (M.S.E.E.)
Master of Science in Engineering (M.S.E.)
Master of Science in Extension Education (M.S.Ext.Ed.)
Master of Science in Forestry (M.S.F.)
Master of Science in Home Economics (M.S.H.E.)
Master of Science in Home Economics Education (M.S.H.Ec.Ed.)
Master of Science in Industrial Engineering (M.S.I.E.)
Master of Science in Journalism (M.S.J.)
Master of Science in Mechanical Engineering (M.S.M.E.)
Master of Science in Mechanics (M.S.T.A.M.)
Master of Science in Engineering of Mines (M.S.E.M.)
Master of Science in Petroleum Engineering (M.S.Pet.E.)
Master of Science in Nuclear Engineering (M.S.N.E.)

Doctor of Philosophy (Ph.D.) in—

Agronomy
Agricultural Biochemistry
Agricultural Microbiology
Animal Nutrition
Biochemistry (Medical)
Biology
Botany
Chemistry
Chemical Engineering
Civil Engineering
Electrical Engineering
Economics
Engineering
Genetics
Geology
Gross and Neurological Anatomy
History
Mechanical Engineering
Microbiology (Medical)
Music
Pharmacology
Physiology
Plant Pathology
Physics
Political Science
Psychology
Theoretical & Applied Mechanics
Zoology

Doctor of Education (Ed.D.)

Doctor of Education in Speech Correction and/or Audiology
Doctor of Education in Music

Doctor of Music

Doctor of Musical Arts

GRADUATE CERTIFICATE

The College of Education offers a Certificate of Advanced Study in Education (see pages 34 and 131-32).

PROFESSIONAL DEGREES

The following professional degrees are conferred upon graduates of the College of Engineering and the School of Mines of West Virginia University on the basis of practical experience and study in absentia, the presentation of a thesis, and an oral final examination:

Aerospace Engineer (A.E.)	Electrical Engineer (E.E.)
Chemical Engineer (Ch.E.)	Mechanical Engineer (M.E.)
Civil Engineer (C.E.)	Engineer of Mines (E.M.)

REQUIREMENTS FOR THE GRADUATE DEGREE

General Regulations

1. CANDIDACY

Admission to candidacy for any graduate degree is conditioned upon the fulfillment of the requirements for admission to the Graduate School, and also the particular requirements of undergraduate and graduate preparation for the field of study in which the student wishes to specialize. Unconditional admission to candidacy for an advanced degree involves a suitable period of graduate work in residence in which the student demonstrates his ability to do work of graduate caliber. Detailed information concerning candidacy for the Master's Degree and the Doctor's Degree may be found on the pages immediately following.

2. REQUIREMENTS TO TAKE GRADUATE RECORD EXAMINATION

Students admitted to the Graduate School to begin a course of study for a degree or for teacher certification after September 1, 1962, will be required to submit scores in the general aptitude test of the Graduate Record Examination. The student's scores in the aptitude test will not affect his admission to or standing in the Graduate School. However, an individual department offering graduate work may consider both aptitude scores and the score in the appropriate advanced test of the Graduate Record Examination in deciding whether to admit a graduate student as a candidate for a degree in the department.[1]

Students should arrange to take the general aptitude test and, if required by the major department, the appropriate advanced test of the Graduate Record Examination prior to their first registration at the University and should request the Educational Testing Service to forward their scores to the Dean of the Graduate School. Students who are unable to do this will be admitted to the Graduate School provisionally and will be required to take the Graduate Record Examination on the first date that it is offered on the West Virginia University campus, or elsewhere, after their admission, unless an extension of time is allowed by the graduate dean.

Information as to dates when the Graduate Record Examination will be offered on the West Virginia University campus can be obtained from the Graduate Office. The fee for the aptitude examination is $7.00; for an advanced test $8.00; for both examinations $12.00.

Those planning to take the examination must apply to the Educational Testing Service, Princeton, New Jersey, at least fifteen days prior to the date of the examination.

[1]The Graduate Record Examination is not required to be taken by students who have already earned a graduate degree.

3. SCHOLARSHIP

No credits are acceptable toward an advanced degree which are reported with a grade lower than "C."

Reasonable standards of oral and written English must be maintained.

To be in good standing, a graduate student must maintain a cumulative grade-point average of 2.0. A student whose grade-point average falls below 2.0 will be placed on probation and required to remove his deficiency within the next twelve hours for which he enrolls. If he fails to do so, he will be suspended from the Graduate School. A student who fails more than one-half of the work for which he is enrolled during any semester or summer session will be suspended. This regulation does not prevent any department from requiring higher standards of scholarship.

4. CURRICULUM

Credit toward a graduate degree may be obtained only for courses listed in these *Announcements* and numbered 200-399.

No more than 15 hours of graduate courses in any one semester nor more than 12 hours of graduate courses in any one Summer Session may be carried by a student. Any exception to this rule must be approved in advance by the Dean of the Graduate School.

5. RESIDENCE AND EXTENSION

Residence credit for special field assignments and for work taken off the University campus shall be allowed only with prior approval of the Dean.

No more than 15 hours of extension work may be counted by any one student toward the Master's Degree.

For majors in Education no more than 15 hours by extension may be counted toward the Master's Degree and of these 15 no more than 8 hours may be obtained before the student completes at least 6 hours in residence on campus.

Full-time in-service teachers may obtain no more than 9 semester hours of credit toward the Master's Degree in any one academic year.

The maximum credit that students pursuing graduate work by extension may receive in any one field shall be 8 semester hours.

No more than 6 hours of graduate credit obtained in other approved institutions may be considered in meeting the requirements for the Master's Degree at West Virginia University.[2] Approval in writing must be secured in advance to elect graduate courses offered elsewhere. Credit will not be established here until the student has successfully completed at least 12 semester hours of graduate work at West Virginia University. Graduate credits so accepted toward the Master's Degree must meet the usual departmental requirements for a continuous and unified program of graduate study and will reduce correspondingly the number of hours of graduate work by extension offered in West Virginia University extension centers that may be offered in meeting the requirements for the Master's Degree.

No credits earned by extension prior to the admission of the student to graduate work and acceptance for graduate study may be counted toward meeting the requirements for the Master's Degree. However, seniors in the colleges of West Virginia University and in colleges where West Virginia University offers graduate courses by extension who are within 10 semester hours of graduation may, with the approval of the Dean of the Graduate School, enroll for graduate courses for which they may receive graduate credit after obtaining their bachelor's degrees. Such graduate courses must not have been offered for undergraduate credit, and in every case permission must have been requested before or at the time of enrolling for the course or courses. Normally, the maximum amount of credit available to a senior by petition in this manner before he completes all requirements for the baccalaureate degree and gains admission to the Graduate School will be 15 semester hours.

[2]This regulation applies to all master's degrees based upon a total credit requirement of 30 to 46 semester hours. The Degree of Master of Social Work is based upon a total credit requirement of 54 to 60 semester hours, 24 to 30 of which may be transferred under suitable conditions, but the last 30 of which must be earned and completed in West Virginia University.

Each graduate student in residence, whether taking course work or engaged in conducting research or in writing a thesis or report, must register at the beginning of each semester or term during which graduate work is being done. He must be registered during the session in which he is to appear for final examination. Under exceptional conditions and with the prior approval of the Dean a graduate student may be permitted to meet a portion of the requirements for the degree in absentia, provided the customary residence and other requirements are met.

6. LIMITATION OF CREDIT LOADS FOR EMPLOYED GRADUATE STUDENTS

Graduate students will be required by their advisers to limit their credit loads in proportion to the outside service rendered and the time available for graduate study. In general, persons in full-time service to the University, or other employer, will be advised to enroll for no more than 6 hours of work in any semester.

7. DISSERTATIONS, THESES, AND PROBLEM REPORTS

All dissertations, theses, and problem reports shall be presented in the form prescribed in the Graduate School publication "Manual on Thesis Writing" at least one month previous to the Commencement Day on which the degree is expected. If the thesis or problem report is accepted, typewritten and bound copies shall be submitted to the Graduate Office at least one week before the degree is to be conferred; a minimum of five copies of the master's thesis and doctor's dissertation, or four copies of the problem report, together with three unbound copies of the abstract is required.

8. FINAL EXAMINATIONS

The candidate shall not be eligible for the final examination until his thesis or problem report has been approved by the examining committee. Following approval of the candidate's thesis or problem report and satisfactory completion of the courses in residence and satisfaction of other graduate requirements, he shall be given a final examination by his advisory committee. Examining committees for these and for final examinations for advanced degrees shall contain no fewer than three members for candidates for the Master's Degree, and no fewer than five members for candidates for the Doctor's Degree. In order to have his thesis accepted or to be considered as having satisfactorily passed his examination, the candidate shall have no more than one unfavorable vote in each case.

9. REQUEST FOR DEGREE

At the time of registration for the semester or session in which the candidate expects to receive a graduate degree, he shall submit a formal request to the Dean of the Graduate School for the conferring of such degree. The candidate must have completed all requirements for the degree which he wishes to receive, at least one week before Commencement Day.

10. COMMENCEMENT ATTENDANCE

Candidates for degrees to be conferred at the close of the second semester are expected to be present in person to receive their degrees.

The Degrees of Master of Arts and Master of Science[3]

REQUIREMENTS FOR CANDIDACY

Satisfactory fulfillment of General Regulation No. 1 for graduate degrees will admit an applicant to candidacy.

[3]Major and minor work toward the Master's Degree is offered by most of the departments and divisions of the University. Offerings of these divisions and departments are given in Part IV.

REQUIREMENTS FOR COMPLETION

The completion within a period of seven years[4] immediately preceding the conferring of the degree, except with the permission of the Dean, of no less than 30 credit hours of graduate work approved by the adviser.

Residence: A minimum of two semesters is required, or one semester and two summer terms, or three summer terms of residence in full-time graduate study at West Virginia University. For students offering 15 credit hours in extension, a minimum period of residence at West Virginia University of one semester or two summer terms shall be required for the Master's Degree.

Program: In general, when a thesis is offered, the program will consist of 24 hours or more of suitable course work and 1 to 6 hours of thesis or research.

Thesis or Problem Report: A thesis or problem report may be required by the faculty of the college, school, or department in which the candidate's major interest lies, but no more than 6 hours of credit earned for research or thesis may be counted in satisfying the requirements for a Master's Degree.

Final Examination: An examination, oral or written or both, at the option of the candidate's examining committee, shall be required, covering the candidate's thesis or problem report, studies in his major and minor fields, and his ability to apply facts and principles.

Special Requirements: The candidate must meet the special requirements of the department in which he pursues his major study.

The Degrees of Master of Agriculture and Master of Home Economics

Requirements: The requirements for and regulations governing the granting of these two degrees are the same as those for the degree of Master of Science with the following exceptions:

1. Candidates for the Degree of Master of Agriculture and Master of Home Economics shall have previously completed the requirements for the Degree of Bachelor of Science in Agriculture or Bachelor of Science in Home Economics, or their equivalents.
2. A research thesis shall not be required, but a problem report on some phase of agriculture or home economics shall be required. Not more than 3 semester hours of credit may be allowed for the problem report, which must be approved by the student's committee. The report must be submitted in the form prescribed by the regulations of the Graduate School.
3. The program of work shall be such that the emphasis will be on breadth of knowledge in the field of agriculture or home economics, as the case may be, rather than upon study in one narrow field of science. To insure such breadth of training, the student must take work in at least five subject-matter fields. Not more than 10 credits will be accepted in any one field and not more than 10 credits from other colleges in the University will be accepted.
4. Special regulations may be made by the subject-matter division concerned, and approved by the Dean of the Graduate School.

The Degree of Master of Social Work

REQUIREMENTS

The degree of Master of Social Work is conferred by the University upon those students satisfactorily completing the requirements as established by the Graduate School. These requirements are:

1. Broad pre-professional training including not fewer than 24 hours of undergraduate work in the social sciences.

[4]This ruling was discontinued temporarily during the war period. It was reinstated, effective June 1, 1948, as follows:

Beginning with the first summer term of 1948, the seven-year rule will again be put into effect with the provision that, in the cases of students who have already started their graduate programs, the adviser and the Dean of the Graduate School will determine whether work taken before the seven-year period shall be accepted for credit. If the adviser and the Dean cannot agree, the case shall be brought before the Executive Committee for review. In the event that a graduate student began work during the war period, an extension up to a maximum of five years may be granted.

2. Completion of graduate courses approved by the Department of Social Work totaling not fewer than 54 semester hours, of which the last 30 hours shall have been completed in West Virginia University.

3. Completion of 20 semester hours of supervised field work under faculty direction.

4. Completion of a problem report.

5. Demonstration of competency in the theory and practice of social work to the satisfaction of the faculty of the Department. This will include passing with a satisfactory grade a comprehensive final examination, which may be oral or written, or both, at the discretion of the Department. The degree will not be awarded solely for credits earned.

For most students the requirements for the Degree of Master of Social Work can be met in two full years of study.

Interdepartmental Programs

Industrial Relations. Degree: Master of Science. (See page 173).

Rehabilitation Counseling. Degree: Master of Science. (See page 190).

The Certificate of Advanced Study in Education

REQUIREMENTS

This is a distinct and terminal program including one full year of graduate study beyond the Master's Degree. The program is open to school administrators, supervisors, counselors, and teachers who furnish evidence of significant and appropriate teaching experience or closely allied educational work. The requirements for the certificate are: completion of 30 approved semester hours in residence earned after the conferring of the Master's Degree, including 6 to 12 semester hours of research. Persons expressing a desire to pursue the program leading to the certificate must satisfy a College of Education faculty committee on prerequisites.

The Degree of Doctor of Philosophy

REQUIREMENTS FOR CANDIDACY

Admission to the Graduate School and enrollment in graduate courses does not of itself imply acceptance of the applicant for a Doctor's Degree. After a period of residence the applicant will be admitted to a comprehensive preliminary or qualifying examination (either oral, or written, or both) in which he must demonstrate: (a) a grasp of the important phases and problems of the field of study in which he proposes to major and an application of their relation to other fields of human knowledge and accomplishments; (b) the ability to employ rationally the instruments of research that have been developed in his major field; and (c) the ability to read French and German in a satisfactory manner. One or more other languages may be substituted for those specified upon recommendation of the student's advisory committee and with the approval of the Dean of the Graduate School.[5] Course work may be substituted for one language only, at the specific written request of a college or department administering a Ph.D. program, subject to the approval of the Executive Committee of the Graduate School and the Dean of the Graduate School.

When an applicant has successfully passed his qualifying examination he will be formally promoted to candidacy for the Doctor's Degree. Admission to candidacy must precede the final examination for the Doctor's Degree by at least one academic year. Graduate courses pursued in fulfillment of the requirements for the Master's Degree, if of suitable character and quality, may be credited toward the doctorate.

[5]In determining the candidate's proficiency in the two requisite foreign languages the major department must choose one of the following procedures:

(1) The examination may be conducted by the appropriate language department, or

(2) The examination may be conducted by a committee of three members—one member from the candidate's major field, one member from a related subject matter field, and one member from the appropriate language department.

REQUIREMENTS FOR COMPLETION

(a) *Curriculum*: The Degree of Doctor of Philosophy is not awarded for the mere accumulation of course credits nor for the completion of a definite residence requirement. The exact amount and nature of course work to be undertaken by a candidate will be determined in light of his previous preparation and the demands of his chosen field of application. The aggregate of correlated courses of graduate instruction should, however, be no less than 60 semester hours, exclusive of research or dissertation, except six hours research or thesis credits earned for the Master's Degree. These credits shall be ordered and distributed so as to promote broad and systematic knowledge and the ability to carry on independent research.

(b) *Residence:* In general, the requirements for the Degree of Doctor of Philosophy contemplate at least three years of full-time graduate work beyond the Bachelor's Degree. A minimum of two semesters of residence in full-time graduate study, or its equivalent, at West Virginia University is required.

(c) *Dissertation*: The candidate must submit a dissertation pursued under the direction of the faculty of this University on some problem in the field of his major interest. The dissertation must present the results of the candidate's individual investigation and must embody a definite contribution to knowledge. While conducting research or writing a dissertation, the student must register at the beginning of each semester or term during which credit is being earned.

Each doctoral candidate must establish 24 semester hours in research and/or dissertation credits or offer the Graduate Dean satisfactory evidence of equivalent time devoted to research and preparation of the dissertation.

(d) *Special Requirements*: The candidate must satisfy such special requirements, subject to approval of the Dean of the Graduate School, as may be required by the faculty of the college, school, or department in which his major lies. All required examinations in modern languages shall be taken not later than one academic year before the final examination for the degree.

All of the requirements for the degree shall be completed within a period of seven years.

(e) *Final Examination*: If the candidate's dissertation is approved and he has fulfilled all other requirements stated above, he will be admitted to final oral examination on his dissertation before his examining committee. At the option of this committee, a comprehensive written examination also may be required.

The Degree of Doctor of Education

This is a professional degree open to school leaders, administrators, teachers, and counselors who furnish evidence of significant and appropriate teaching experience. Persons expressing a desire to pursue the program leading to this degree must satisfy a College of Education faculty Committee on Prerequisites. (See page 132).

Part III
THE GRADUATE FACULTY

Ex officio members: The President of the University, the Vice Presidents, the Provost, and Deans of the various colleges and schools.

COLLEGE OF AGRICULTURE, FORESTRY, AND HOME ECONOMICS

Agricultural Biochemistry and Nutrition

Homer Patrick, Ph.D., *Chairman and Professor of Agricultural Biochemistry* (1963), 1957.
Wayne Wesley Luchsinger, Ph.D., *Associate Professor of Agricultural Biochemistry and Nutrition* (1960).
William Gilbert Martin, Ph.D., *Assistant Professor of Agricultural Biochemistry* (1963), 1958.

Agricultural Economics

Homer Clark Evans, Ph.D., *Chairman and Professor of Agricultural Economics* (1959), 1949.
Alfred Lowell Barr, Ph.D., *Associate Professor of Agricultural Economics* (1961).
James Harris Clarke, M.S., *Professor of Agricultural Economics* (1960), 1939.
Albert Estern Drake, Ph.D., *Director of Computer Center* (1963).
Robert Lee Jack, Ph.D., *Assistant Professor of Consumer Economics* (1963).
Kenneth Dale McIntosh, M.S., *Assistant Professor of Agricultural Economics* (1957).
Ernest Joseph Nesius, Ph.D., *Professor of Agricultural Economics* (1960).
Paul Emmett Nesselroad, M.S., *Assistant Professor of Agricultural Economics* (1954).
Leonard Marion Sizer, Ph.D., *Associate Professor of Rural Sociology* (1959), 1953.
George E. Toben, M.S., *Professor of Agricultural Economics* (1960), 1946.

Agricultural Education

Russell Clarke Butler, Ph.D., *Chairman and Professor of Agricultural Education* (1956), 1944.
John Jackson Harvey, Ph.D., *Associate Professor of Agricultural Education for Cooperative Extension Education Teaching* (1961), 1953.
Warren George Kelly, M.S., *Assistant Professor of Agricultural Education* (1957).
Robert Vaughn Kerwood, M.S., *Assistant Professor of Agricultural Education* (1963).
Oliver Claude McGhee, M.S., *Assistant Professor of Agricultural Education* (1961). (On leave—September 1, 1964-August 31, 1965).

Agronomy and Genetics

George Gordon Pohlman, Ph.D., *Chairman and Professor of Agronomy* (1938), 1930.
F. Dale Childs, M.S., *Instructor in Agronomy* (1964), 1962.
Carl Franklin Engle, Ph.D., *Assistant Professor of Agronomy* (1964).
Paul Robert Henderlong, Ph.D., *Assistant Professor of Agronomy* (1964).
Everett Milton Jencks, Ph.D., *Assistant Professor of Agronomy* (1957).
Gerald Alvin Jung, Ph.D., *Associate Professor of Agronomy* (1962), 1958.
Igor Vladimir Sarkissian, Ph.D., *Associate Professor of Genetics* (1962).
Valentin Ulrich, Ph.D., *Associate Professor of Genetics* (1962), 1957.
Willem Adolph van Eck, Ph.D., *Associate Professor of Agronomy* (1963), 1957.
Collins Veatch, Ph.D., *Professor of Agronomy* (1959), 1945.

Animal Industry and Veterinary Science

Marvin Richard McClung, Ph.D., *Chairman and Professor of Animal Industry and Veterinary Science* (1964), 1942.
Richard Atkins Ackerman, M.S., *Assistant Professor of Dairy Science* (1946), 1928.
Gerald Clifton Anderson, Ph.D., *Professor of Animal Science* (1955), 1950.
Leslie Dozsa, D.V.M., *Associate Professor of Veterinary Science* (1961), 1957.
Robert Standish Dunbar, Jr., Ph.D., *Dean of the College and Professor of Statistics* (1964), 1952.
Donald James Horvath, Ph.D., *Associate Professor of Animal Science* (1960), 1957.
Harold Marteney Hyre, M.S., *Associate Professor of Poultry Science* (1944), 1931.
Emmett Keith Inskeep, Ph.D., *Assistant Professor of Animal Science* (1964).
Harold Edward Kidder, Ph.D., *Professor of Animal Science* (1960), 1957.
James Leonard McBee, Ph.D., *Associate Professor of Animal Science* (1964), 1959.
George Aiken McLaren, Ph.D., *Professor of Nutritional Biochemistry* (1963), 1955.
Norman Olaf Olson, D.V.M., *Professor of Veterinary Science* (1948).
Robert Leslie Reid, Ph.D., *Associate Professor of Animal Nutrition* (1963), 1957.
Roy Orlando Thomas, Ph.D., *Assistant Professor of Animal Nutrition* (1964).
Samuel Josephus Weese, M.A., *Associate Professor of Dairy Science* (1951), 1945.

Forestry

W. Clement Percival, Ph.D., *Director and Professor of Forestry* (1939), 1934.
Arthur Barton Brauner, M.W.T., *Instructor in Wood Technology* (1963).
Maurice Graham Brooks, M.S., *Professor of Wildlife Management* (1947), 1938.
Kenneth Llewellyn Carvell, D.For., *Professor of Silviculture* (1964), 1953.
Franklin Charles Cech, Ph.D., *Associate Professor of Forest Genetics* (1964).
Allen Wright Goodspeed, M.F., *Professor of Forest Management* (1949).
Albert Edwin Grafton, M.S.A., *Instructor in Forestry* (1963).
John Robert Hamilton, Ph.D., *Professor of Wood Science* (1964).
Norman Delmar Jackson, M.W.T., *Assistant Professor of Wood Technology* (1961), 1953.
Christian Burdick Koch, M.S., *Associate Professor of Wood Technology* (1964), 1951.
Don Lee Kulow, Ph.D., *Assistant Professor of Forest Mensuration* (1963).
Robert Leo Smith, Ph.D., *Assistant Professor of Wildlife Management* (1958).
Ronald Brooke Stemple, M.S., *Instructor in Forestry* (1964).
Earl Haven Tryon, Ph.D., *Professor of Silviculture* (1952), 1945.
David Evans White, Ph.D., *Assistant Professor of Forestry Economics* (1964).

Home Economics

Mary Rose Jones, M.S., *Acting Director of Division of Home Economics and Associate Professor of Home Economics* (1964), 1941.
Barbara N. Armstrong, M.S., *Instructor in Home Economics* (1962).
Gladys Raber Ayersman, M.S., *Assistant Professor of Home Economics* (1959), 1956.
Sara Ann Brown, Ph.D., *Professor of Home Economics Education* (1955), 1948.
Montelle Dietrich, M.S., *Associate Professor of Home Economics* (1962), 1929.
Babette Graf, M.S., *Assistant Professor of Home Economics* (1961).
Robert Jack, Ph.D., *Assistant Professor of Consumer Economics* (1963).
Betty Lou Ramsey, M.S., *Assistant Professor of Home Economics* (1963), 1956.
Carl B. Taylor, Ph.D., *Assistant Professor of Family Life* (1961).
Ruth E. Weibel, M.S., *Instructor in Home Economics* (1962).
Elisabeth Steele Yearick, Ph.D., *Associate Professor of Home Economics* (1959).

Horticulture

Eion George Scott, Ph.D., *Chairman and Professor of Horticulture* (1962).
William Henry Childs, Ph.D., *Professor of Horticulture* (1953), 1931.
Arthur Pingree Dye, M.S., *Associate Professor of Horticulture* (1962), 1923.
William Robert Fortney, Ph.D., *Associate Professor of Horticulture* (1960), 1956.
Morris Ingle, Ph.D., *Assistant Professor of Horticulture* (1963).

Ray Stanley Marsh, A.M., *Professor of Horticulture* (1936).
Oliver Meader Neal, Jr., Ph.D., *Professor of Horticulture* (1963), 1942.
Oscar Edmund Schubert, Ph.D., *Professor of Horticulture* (1961), 1949.
Glenn Edward Steyers, M.S., *Associate Professor of Horticulture* (1960).
Kyle Chester Westover, Ph.D., *Professor Emeritus of Horticulture* (1963), 1921.

Plant Pathology, Bacteriology, and Entomology

Horace Leslie Barnett, Ph.D., *Chairman of Plant Pathology, Bacteriology, and Entomology and Professor of Mycology* (1960), 1945.
Robert Evan Adams, Ph.D., *Associate Professor of Plant Pathology* (1960), 1953.
Carl Kester Dorsey, Ph.D., *Professor of Entomology* (1951).
Edward Sumner Elliott, Ph.D., *Associate Professor of Plant Pathology* (1961), 1953.
Mannon Elihu Gallegly, Jr., Ph.D., *Professor of Plant Pathology* (1960), 1949.
John Albert Koburger, Ph.D., *Assistant Professor of Agricultural Bacteriology* (1962).
Julian Gilbert Leach, Ph.D., *Professor of Plant Pathology* (1938).
Virgil Greene Lilly, Ph.D., *Professor of Physiology* (1949), 1927.
William Wallace Neel, Ph.D., *Assistant Professor of Entomology* (1963).
Rodney Philip True, Ph.D., *Professor of Plant Pathology* (1955), 1949.
Harold Albert Wilson, Ph.D., *Professor of Agricultural Bacteriology* (1957), 1947.

COLLEGE OF ARTS AND SCIENCES

Biology

Earl Lemley Core, Ph.D., *Chairman of Biology and Professor of Botany* (1948), 1928.
Charles Henry Baer, Ph.D., *Assistant Professor of Biology* (1961), 1948.
Elizabeth Ann Bartholomew, M.S., *Curator of Herbarium and Instructor in Biology,* (1963), 1938.
Herald Durward Bennett, Ph.D., *Professor of Botany,* (1961), 1948.
Arnold Benson, M.A., *Instructor in Biology* (1959).
Robert Lee Birch, M.S., *Instructor in Zoology* (1948).
W. Newman Bradshaw, Ph.D., *Assistant Professor of Biology* (1962).
Roy Burdette Clarkson, Ph.D., *Assistant Professor of Biology* (1960), 1956.
Jesse Franklin Clovis, Ph.D., *Associate Professor of Biology* (1963), 1957.
Mullen Ogle Coover, M.S., *Instructor in Biology* (1961), 1950.
Lloyd Raymond Cribble, Ph.D., *Associate Dean, Arts and Sciences, and Professor of Zoology* (1947), 1929.
Willis Hugh Hertig, Jr., Ph.D., *Instructor in Biology* (1960).
Henry Winthrop Hurlbutt, Ph.D., *Assistant Professor of Zoology* (1963).
Ethel Charlotte Montiegel, M.S., *Instructor in Zoology* (1956).
Charles Norman, Ph.D., *Professor of Biology* (1961), 1953.
Leah Ann Williams, M.S., *Instructor in Biology* (1959).

Chemistry

Vincent J. Traynelis, Ph.D., *Chairman and Professor of Chemistry* (1964).
Armand Rene Collett, Ph.D., *Professor of Chemistry* (1939), 1924.
John Arthur Gibson, Jr., Ph.D., *Professor of Chemistry* (1952), 1926.
Jack Daniel Graybeal, Ph.D., *Associate Professor of Chemistry* (1962), 1957.
George Arthur Hall, Jr., Ph.D., *Associate Professor of Chemistry* (1956), 1950.
James Lester Hall, Ph.D., *Professor of Chemistry* (1955), 1946.
James Blake Hickman, Ph.D., *Professor of Chemistry* (1962), 1946.
George Louis Humphrey, Ph.D., *Associate Professor of Chemistry* (1952).
Charles Lester Lazzell, Ph.D., *Professor of Chemistry* (1946), 1921.
Dennis William Herbert MacDowell, Ph.D., *Assistant Professor of Chemistry* (1959).
Chester William Muth, Ph.D., *Professor of Chemistry* (1963), 1949.
Armine Deane Paul, Ph.D., *Associate Professor of Chemistry* (1961), 1955.
Peter Popovich, Ph.D., *Associate Professor of Chemistry* (1960), 1946.
John Henry Strohl, Ph.D., *Assistant Professor of Chemistry* (1964).
Anthony Winston, Ph.D., *Assistant Professor of Chemistry* (1959).

English

James Paul Brawner, Ph.D., *Chairman and Professor of English* (1952), 1935.
Carter Richard Bishop, Ph.D., *Professor of English* (1952), 1929.
Ruel Elton Foster, Ph.D., *Professor of English* (1957), 1941.
Patrick Ward Gainer, Ph.D., *Professor of English* (1957), 1946.
John Lewis Hicks, Jr., M.A., *Associate Professor of English* (1964), 1949.
John Hubert Johnston, Ph.D., *Associate Professor of English* (1964), 1954.
Mary Nadine Page, M.A., *Assistant Professor of English* (1946), 1925.
Gordon Marshall Pitts, Ph.D., *Associate Professor of English* (1964), 1960.
John Racin, Jr., Ph.D., *Assistant Professor of English* (1964).
John F. Stasny, M.A., *Instructor in English* (1955).

Foreign Languages

Robert Stilwell, Ph.D., *Chairman of Foreign Languages and Professor of German* (1963), 1947.
Michel Joseph Beauchemin, M.A., *Instructor in Romance Languages* (1956).
William Franklin Boggess, Ph.D., *Assistant Professor of Ancient and Classical Languages* (1962).
M. William Buechele, M.A., *Instructor in German* (1964).
Odilie Cantillano y Vives, M.A., *Instructor in Spanish* (1959).
Rafael Rivera del Valle, Ph.D., *Associate Professor of Latin American Area Studies* (1963).
Frederick William Franck, M.A., *Instructor in Spanish and Latin* (1960).
Emile George Frere, Ph.D., *Associate Professor of French* (1961), 1947.
Francisco Herrera, M.A., *Associate Professor of Spanish and Chairman of Latin American Area Studies* (1964), 1946.
Donald Thedron Huffman, M.A., *Instructor in German* (1956).
Victor Jacob Lemke, Ph.D., *Professor of German* (1955), 1939.
Arthur Cook McBride, Docteur de l'Universite Bordeaux, *Professor of French* (1960), 1926.
Warren Francis Manning, Ph.D., *Professor of Romance Languages* (1952), 1928.
Bohdan Plaskacz, Ph.D., *Professor of Slavic Languages* (1963).
John Pushkarsh, Jr., A.M., *Instructor in Russian* (1955).
Armand Edwards Singer, Ph.D., *Professor of Romance Languages and Chairman of Humanities* (1963), 1940.
Harley Ustus Taylor, Jr., Ph.D., *Assistant Professor of German* (1963), 1949.
Rebecca Estra Wade, M.A., *Assistant Professor of French* (1955), 1945.

Geology and Geography

Dana Wells, Ph.D., *Chairman and Professor of Geology* (1961), 1930.
Arthur Edgar Burford, Ph.D., *Associate Professor of Geology* (1963), 1960.
Robert Guy Corbett, Ph.D., *Assistant Professor of Geology* (1962).
Chester Lee Dodson, M.S., *Assistant Professor of Geology* (1963).
Alan Chase Donaldson, Ph.D., *Associate Professor of Geology* (1962), 1957.
Harry Marion Fridley, Ph.D., *Professor Emeritus of Geology* (1964), 1928.
William Harry Gillespie, M.S., *Instructor in Geology* (1958), 1957.
Milton Tidd Heald, Ph.D., *Professor of Geology* (1960), 1948.
Richard Stark Little, Ph.D., *Assistant Professor of Geography* (1962).
John Charles Ludlum, Ph.D., *Professor of Geology* (1956), 1946.
Paul Holland Price, Ph.D., *Professor of Geology* (1960).

History

William Thomas Doherty, Ph.D., *Chairman and Professor of History* (1963).
Wesley Marvin Bagby, Ph.D., *Associate Professor of History* (1962), 1956.
William Derrick Barns, Ph.D., *Associate Professor of History* (1954), 1940.
John Anthony Caruso, Ph.D., *Professor of History* (1962), 1950.
Elizabeth Cometti, Ph.D., *Professor of History* (1964).
Ray Ellsworth Cubberly, M.A., *Assistant Professor of History* (1963).
Thomas Edson Ennis, Ph.D., *Professor of History* (1946), 1930.
John Ford Golay, D.Phil.(Oxon.), *Professor History* (1961).
J. William Hess, Ph.D., *Assistant Professor of History* (1964).
Mortimer Levine, Ph.D., *Associate Professor of History* (1961), 1955.
Kurt Rosenbaum, Ph.D., *Assistant Professor of History* (1962).
Edward Marvin Steele, Jr., Ph.D., *Associate Professor of History* (1961), 1956.
Festus Paul Summers, Ph.D., *Professor of History* (1946), 1932.

Library Science

Robert Ferguson Munn, Ph.D., *Director of University Libraries and Chairman of Library Science* (1957), 1952.
Olive Densmore Lewis, B.S., *Assistant Professor of Library Science* (1962).
Charles Darold Patterson, M.A., *Assistant Professor of Library Science* (1962).
Florence Katherine Reese, M.A., *Professor of Library Science* (Retired) (1964), 1935.

Mathematics

Joseph Kyle Stewart, Ph.D., *Chairman and Professor of Mathematics* (1952), 1930.
Charles Nelson Cochran, M.S., *Assistant Professor of Mathematics* (1957), 1951.
Allen Byron Cunningham, Ph.D., *Professor of Mathematics* (1960), 1946.
Hannibal Albert Davis, Ph.D., *Professor of Mathematics* (1947), 1924.
James Robert Dosier, M.A., *Instructor in Mathematics* (1959).
Joy Bromberg Easton, M.S., *Instructor in Mathematics* (1955), 1948.
Bernard Gilbert, M.S., *Instructor in Mathematics* (1958).
Helen Louise Godfrey, M.S., *Instructor in Mathematics* (1961).
Henry Wadsworth Gould, M.A., *Assistant Professor of Mathematics* (1961), 1958.
Lois Vivaneen Heflin, M.S., *Instructor in Mathematics* (1956).
Franz X. Hiergeist, Ph.D., *Assistant Professor of Mathematics* (1964).
John Wesley Hogan, M.S., *Instructor in Mathematics* (1962).
Wilma Jean Loudin, M.S., *Instructor in Mathematics* (1960).
Harry B. McClung, M.S., *Instructor in Mathematics* (1962).
Betty Louise Miller, M.S., *Instructor in Mathematics* (1957).
Iland Dee Peters, M.S., *Associate Professor of Mathematics* (1957), 1941.
John S. Skocik, M.S., *Instructor in Mathematics* (1962).
Charles Henry Vehse, Ph.D., *Professor of Mathematics* (1947), 1929.
Marvin Lewis Vest, Ph.D., *Professor of Mathematics* (1955), 1931.
Ronson J. Warne, Ph.D., *Professor of Mathematics* (1964).

Philosophy

Joseph F. Lambert, Ph.D., *Chairman and Professor of Philosophy* (1963).
John Reginald Cresswell, Ph.D., *Professor of Philosophy* (1964), 1929.
Robert Dean Jewell, M.A., *Assistant Professor of Philosophy* (1964).
William Sherman Minor, B.D., *Associate Professor of Philosophy* (1964), 1945.
Alan Martin Phillips, M.A., *Instructor in Philosophy* (1964).

Physics

Charles D. Thomas, Ph.D., *Chairman and Professor of Physics* (1947), 1931.
Atam P. Arya, Ph.D., *Assistant Professor of Physics* (1964).
O. Rex Ford, Ph.D., *Professor Emeritus of Physics* (1963), 1925.
Oleg Jefimenko, Ph.D., *Associate Professor of Physics* (1960), 1956.
Arnold D. Levine, Ph.D., *Assistant Professor of Physics* (1962), 1957.
Arthur S. Pavlovic, Ph.D., *Associate Professor of Physics* (1962), 1959.
Harvey N. Rexroad, Ph.D., *Professor of Physics* (1962), 1947.
William E. Vehse, Ph.D., *Assistant Professor of Physics* (1961).
Douglas B. Williamson, Ed.D., *Associate Professor of Physics* (1960), 1946.

Political Science

John Rodney Williams, Ph.D., *Chairman and Professor of Political Science* (1961), 1949.
Thomas Mitchell Drake, M.A., *Assistant Professor of Political Science* (1962).
Carl Maynard Frasure, Ph.D., *Professor of Political Science* (1940), 1927.
Robert Carlton Gibson, Ph.D., *Assistant Professor of Political Science* (1961).
Royal Clarence Gilkey, Ph.D., *Associate Professor of Political Science* (1963), 1957.
Donald Edward Hayhurst, Ph.D., *Associate Professor of Political Science* (1959), 1956.
George Wesley Rice, Ph.D., *Assistant Professor of Political Science* (1960).
William Robert Ross, M.A., *Associate Professor of Political Science* (1963), 1939.
Irvin Stewart, Ph.D., *Professor of Political Science* (1958), 1946.
Ralph Milton White, LL.B., M.A., *Assistant Professor of Political Science* (1951), 1949.

Psychology

Quin Fischer Curtis, Ph.D., *Chairman and Professor of Psychology* (1949), 1941.
James Franklin Carruth, Ph.D., *Associate Professor of Psychology* (1957), 1953.
Orrin Hartshorn Cross, Ph.D., *Associate Professor of Psychology* (1957), 1951.
Robert Lee Decker, Ph.D., *Associate Professor of Psychology* (1962), 1955.
Lester Lynn Ourth, Ph.D., *Assistant Professor of Psychology* (1962).
Eugene Anthony Quarrick, Ph.D., *Assistant Professor of Psychology* (1962).
Robert Edward Rankin, Ph.D., *Associate Professor of Psychology* (1961), 1954.
K. Warner Schaie, Ph.D., *Associate Professor of Psychology* (1964).
James Nicholas Shafer, Ph.D., *Associate Professor of Psychology* (1959), 1953.
Arthur Raymond Thomas, Ph.D., *Associate Professor of Psychology* (1962), 1956.

Social Work

Bernard Scher, D.S.W., *Chairman and Professor of Social Work* (1961), 1960.
Anna E. Blackwell, A.M., *Associate in Rehabilitation Social Work* (1963).
H. Otto Dahlke, Ph.D., *Visiting Associate Professor of Social Work* (1964).
Ruth S. Dahlke, M.S.W., *Instructor in Social Work* (1964).
Helen Steele Ellison, M.S.S.W.,*Assistant Professor of Social Work* (1961), 1954.
Thompson R. Fulton, A.M., *Professor of Social Work* (1953), 1946.
Josephine Harris, M.S.W., *Associate in Psychiatric Social Work* (1964).
George O'Connell Harvey, A.M., *Associate in Psychiatric Social Work* (1963), 1961.
Caroline Turton Mudd, M.S.W., *Associate Professor of Social Work* (1957).
Aaron Sacks, M.S., *Lecturer* (part-time) (1955).
Victor L. Schneider, M.S.W., *Assistant Professor of Social Work* (1962).

Sociology

Harold Allan Gibbard, Ph.D., *Chairman and Professor of Sociology* (1948).
Harold Neely Kerr, Ph.D., *Associate Professor of Sociology* (1959), 1946.
Edward Vance McMichael, Ph.D., *Assistant Professor* (part-time) *of Sociology* (1964).
Paul Ausborn Miller, Ph.D., *President of the University and Professor of Sociology* (1962), 1938.
Fred B. Silberstein, Ph.D., *Assistant Professor of Sociology* (1958), 1955.
Neil J. Weller, Ph.D., *Assistant Professor of Sociology* (1958).
John Stanley Zawacki, Ph.D., *Assistant Professor of Sociology* (1963), 1961.

Speech

Lloyd Washington Welden, Sr., M.A., *Acting Chairman and Professor of Speech* (1961), 1947.
William L. Barnett, M.A., *Instructor in Speech* (1961).
Beverly Claire Cortes, M.A., *Instructor in Speech* (1961).
Leonard McCutchan Davis, Ph.D., *Associate Professor of Speech* (1963), 1954.
Betty Snyder Hall, M.A., *Instructor in Speech* (1961).
James Harold Henning, Ph.D., *Professor of Speech* (1945).
James Myers Mullendore, Ph.D., *Professor of Speech* (1963).
Edwin Richard Page, M.A., *Assistant Professor of Speech* (1964).
Walter Harrison Rockenstein, M.A., *Instructor in Speech* (1956).
Barbara Seyler Thomas, M.A., *Instructor in Speech* (1961).
Harrison Waldo Wasson, Ph.D., *Professor of Speech* (1962).

COLLEGE OF COMMERCE

Thomas Corwith Campbell, Ph.D., *Dean of the College of Commerce and Professor of Economics* (1964), 1948.
Vance Quentin Alvis, Ph.D., *Professor of Economics* (1960), 1956.
Edwin William Crooks, D.B.A., *Professor of Marketing* (1964), 1954.
Leo Fishman, Ph.D., *Professor of Economics and Finance* (1952), 1947.
Thomas William Gavett, Ph.D., *Associate Professor of Economics* (1961), 1957.
Raymond Michael Haas, D.B.A., *Assistant Professor of Marketing* (1961).
Paul W. Hamelman, Ph.D., *Associate Professor of Management* (1964), 1960.
Thomas Stanley Isaack, D.B.A., *Professor of Management* (1960), 1951.
Dennis R. Leyden, B.S., *Assistant Professor of Economics* (1962).
Robert Shriver Maust, M.S., *Assistant Professor of Accounting* (1963).
Joseph Newhouse, M.A., *Assistant Professor of Economics and Finance* (1956), 1949.
Evan Owen Roberts, Ph.D., *Professor of Economics and Marketing* (1953), 1939.

Charles Preston Skaggs, M.S., C.P.A., *Assistant Professor of Accounting* (1964), 1954.
Anthony H. Stocks, Ph.D., *Assistant Professor of Economics* (1961).
James Howard Thompson, Ph.D., *Professor of Economics* (1958), 1948.
Vern Hargrave Vincent, Ph.D., C.P.A., *Professor of Accounting* (1957).
Fred Earl Wright, A.M., *Associate Professor of Finance* (1963), 1951.

CREATIVE ARTS CENTER

Division of Music

Richard Edward Duncan, Ph.D., *Dean and Director of the Creative Arts Center and Professor of Music* (1964), 1958.
Clifford Woodrow Brown, M.F.A., *Professor of Music and Chairman of the Department of Music Education. Music Education* (1962), 1941.
Francis Thomas Borkowski, M.M., *Assistant Professor of Music. Clairnet, Director of Bands* (1962), 1961.
Thomas Scribner Canning, M.M., *Associate Professor of Music. Composition. Theory* (1963).
Walter Lee Coplin, M.M., *Assistant Professor of Music. String Bass, Instrument Classes* (1952), 1947.
Arno Paul Drucker, M.M., *Assistant Professor of Music and Chairman of Applied Music Department. Piano* (1962), 1959.
Ruth Landes Drucker, M.M., *Instructor* (part-time) *in Music. Voice* (1961).
Jon Evan Engberg, M.M., *Assistant Professor of Music. Violoncello, Theory* (1963), 1959.
Clyde Neville English, D.S.M., *Associate Professor of Music, Organ, Church Music* (1953), 1945.
Reginald H. Fink, M.M., *Assistant Professor of Music. Brass Instruments, Theory* (1962).
Herman Godes, M.M., *Associate Professor of Music. Piano* (1960).
Joseph Arnold Golz, M.A., *Associate Professor of Music and Director of Opera Department and Choral Organizations* (1962), 1959.
Leo Horacek, Ph.D., *Associate Professor of Music. Music Education* (1962), 1960.
Gerald Lefkoff, Ph.D., *Assistant Professor of Music. Theory, Viola* (1961).
Frank Edell Lorince, Jr., M.M., *Assistant Professor of Music and Acting Chairman of Department of Theory and Composition. Theory* (1960), 1950.
David Lloyd, B.M., *Professor of Music. Voice* (1963).
Elizabeth McEnney, M.M., *Assistant Professor of Music. Voice* (1949).
Bernard Ronald McGregor, M.F.A., *Assistant Professor of Music. Voice, Lecturer in Music* (1950), 1935.
James Edward Miltenberger, M.M., *Instructor in Music. Piano* (1962).
Jane Rhodes Pestun, M.M., *Instructor in Music. Piano* (1945).
Donald Charles Portnoy, M.A., *Assistant Professor of Music. Violin, Director of Symphony Orchestra and of the Summer Music Camp* (1962), 1959.
George Etheridge Schafer, Ph.D., *Professor of Music and Chairman of the Graduate Department; Lecturer in Music* (1962), 1954.
Jane C. Scott, M.M., *Assistant Professor of Music. Music Education, Lecturer in Music* (1958).
Forrest W. Standley, *Instructor* (part-time) *in Music. French Horn* (1963).
Budd Allen Udell, M.M.E., *Instructor in Music. Double Reeds, Director of Marching Band* (1963).
J Kenneth Wood, M.M., *Associate Professor of Music. Theory, Lecturer in Music* (1948), 1928.

Division of Art

John Donald Clarkson, M.A., *Chairman and Professor of Art* (1961), 1948.
Barbara Adeline Drainer, M.A., *Assistant Professor of Art* (1957), 1952.
Ben Frank Freedman, M.A., *Assistant Professor of Art* (1962), 1957.
Joe Francis Moss, M.A., *Instructor in Art* (1960).
Charles Edwin Patton, A.M., *Professor of Art* (1951), 1939.

Division of Drama

Sam Boyd, Jr., M.F.A., *Chairman and Professor of Drama* (1964), 1943.
Larry Dean Augustine, M.A., *Instructor in Drama* (1964).
Robert Barker Burrows, Ph.D., *Professor of Drama* (1963), 1948.
Joe Edward Ford, M.A., *Assistant Professor of Drama* (1960), 1953.
Lenette May Hardin, M.A., *Instructor in Drama* (1959).
Perry H. Leuders, M.F.A., *Instructor in Drama* (1963).
Charles David Neel, M.A., *Instructor in Drama* (1960).

COLLEGE OF EDUCATION

Earl Ruffner Boggs, Ph.D., *Dean and Professor of Education* (1960).
Andrew Kolb Ault, M.Ed., *Instructor in Education* (1961), 1952.
Benjamin Hastings Bailey, Ed.D., *Associate Professor of Education* (1962), 1959.
Laddie Reed Bell, Ed.D., *Associate Professor of Education* (1962).
Thomas John Brennan, Ed.D., *Professor of Education* (1959), 1935.
Sara Ann Brown, Ph.D., *Professor of Education* (1955), 1946.
Russell Clark Butler, Ph.D., *Professor of Education* (1956), 1944.
Kermit Alderson Cook, Ph.D., *Professor of Education* (1959), 1935.
Glennis Hudkins Cunningham, M.A., *Instructor in Education* (1956).
Wilson Irvin Gautier, M.A., *Instructor in Education* (1963).
Delvin Dae Harrah, Ed.D., *Associate Professor of Education* (1962).
Arthur Newsome Hofstetter, Ed.D., *Professor of Education* (1960), 1955.
Frederick John Holter, Ph.D., *Professor of Education* (1963).
Stanley Ausburn Huffman, Jr., Ed.D., *Assistant Professor of Education* (1963).
Stanley Oliver Ikenberry, Ph.D., *Assistant Professor of Education* (1962).
Walter Henry Jarecke, Ed.D., *Professor of Education* (1957), 1953.
William K. Katz, M.S., *Assistant Professor of Education* (1959).
Eddie Clifton Kennedy, Ed.D., *Professor of Education* (1957), 1953.
Marvin Robert Lee, M.A., *Instructor in Education* (1959), 1956.
Rogers McAvoy, M.A., *Instructor in Education* (1961).
Delmas Ferguson Miller, Ph.D., *Professor of Education* (1958), 1950.
James M. Mullendore, Ph.D., *Professor of Education* (1964).
Robert Hudkins Neff, Ed.D., *Assistant Professor of Education* (1962), 1956.
William Vaughn Wagner, Ed.D., *Associate Professor of Education* (1963), 1959.

COLLEGE OF ENGINEERING

Aerospace Engineering

Jerome Ben Fanucci, Ph.D., *Chairman and Professor of Aerospace Engineering* (1964).
Nathan Ness, Ph.D., *Professor of Aerospace Engineering* (1964).
William Squire, M.S., *Professor of Aerospace Engineering* (1961).
Richard Edison Walters, M.S.A.E., *Instructor in Aerospace Engineering* (1959).

Agricultural Engineering

Alfred Delbert Longhouse, Ph.D., *Chairman and Professor of Agricultural Engineering* (1945), 1938.
Edmond Byrl Collins, M.S.Ag.E., *Assistant Professor of Agricultural Engineering* (1962), 1960.
Walter Howard Dickerson, Jr., M.S.Ag.E., *Professor of Agricultural Engineering* (1957), 1953.
Kendall Clark Elliott, M.S.Ag.E., *Assistant Professor of Agricultural Engineering* (1962), 1954.
Roy Eugene Emerson, M.S., *Associate Professor of Agricultural Engineering* (1957), 1940.
Ross Alonzo Phillips, M.S.Ag.E., *Assistant Professor of Agricultural Engineering* (1955).

Chemical Engineering

Howard Perry Simons, Ph.D., *Chairman and Professor of Chemical Engineering* (1947).

William Robert Boyle, M.S.N.E., *Instructor in Nuclear Engineering* (1960).
Harold Vincent Fairbanks, M.S., *Professor of Metallurgical Engineering* (1955).
Alfred Freddie Galli, M.S., *Associate Professor of Chemical Engineering* (1956).
Dean Owen Harper, Ph.D., *Assistant Professor of Chemical Engineering* (1963).
Paul Russell Jones, M.S., *Professor of Ceramic Engineering* (1957).
James Albert Kent, Ph.D., *Professor of Nuclear Engineering* (1958).
Walter Allos Koehler, Ph.D., *Professor Emeritus of Chemical Engineering* (1963), 1929.
Chin-Yung Wen, Ph.D., *Professor of Chemical Engineering* (1959).

Civil Engineering

James Hamilton Schaub, Ph.D., *Chairman and Professor of Civil Engineering* (1960).
Wilfred Harmon Baker, M.S.C.E., *Professor of Civil Engineering* (1955), 1941.
Jerry Cameron Burchinal, M.S.C.E., *Professor of Civil Engineering* (1962), 1946.
Everett Charlie Carter, M.Eng., *Assistant Professor of Civil Engineering* (1963).
Charles Robert Jenkins, Ph.D., *Associate Professor of Sanitary Engineering* (1964), 1961.
Emory Leland Kemp, Ph.D., *Associate Professor of Civil Engineering* (1962).
Benjamin Linsky, M.S.E., *Professor of Sanitary Engineering (Air Pollution)* (1963).
Za Lee Moh, Ph.D., *Associate Professor of Civil Engineering* (1962), 1961.
Lyle Kimball Moulton, M.S.C.E., *Instructor in Civil Engineering* (1963).
Byron Edward Ruth, M.S.C.E., *Instructor in Civil Engineering* (1961).

Electrical Engineering

Edwin Channing Jones, M.S.E.E., *Chairman and Professor of Electrical Engineering* (1925).
David Franklin Barbe, M.S.E.E., *Instructor in Electrical Engineering* (1963).
Edwin Clyde Barbe, M.S.E.E., *Assistant Professor of Electrical Engineering* (1956).
Everette Charles Dubbe, B.S.E.E., *Associate Professor of Electrical Engineering* (1947).
Mason Marcus Peterson, B.S.E.E., *Associate Professor of Electrical Engineering* (1948).
Marion Judson Smith, M.S.E.E., *Professor of Electrical Engineering* (1954).
Nelson Stuart Smith, Jr., D.Sc., *Assistant Professor of Electrical Engineering* (1956).
Robert Earl Swartwout, Ph.D., *Associate Professor of Electrical Engineering* (1962).
Ralph Hough Theophilus, M.Ed., *Associate Professor of Electrical Engineering* (1956).

Industrial Engineering

Raymond Edwin Shafer, M.S.I.E., *Chairman and Professor of Industrial Engineering* (1951), 1949.
J. Temple Black, M.S.I.E., *Instructor in Industrial Engineering* (1960).
Charles Caruthers Cook, M.S.I.E., *Assistant Professor of Industrial Engineering* (1960), 1957.
Robert Durant Fowler, M.S.I.E., *Professor of Industrial Engineering* (1963), 1959.
Joseph William Schmidt, Jr., M.S.I.E., *Instructor in Industrial Engineering* (1962).

Mechanical Engineering

Howard Wallace Butler, Ph.D., *Chairman and Professor of Mechanical Engineering* (1965).
Harold Malcolm Cather, M.S.M.E., *Professor of Mechanical Engineering* (1945).
Hasan Tahsin Gencsoy, M.S.M.E., *Associate Professor of Mechanical Engineering* (1957).
James Francis Hamilton, Ph.D., *Professor of Mechanical Engineering* (1963), 1960.
Jerome Forest Parmer, Ph.D., *Associate Professor of Mechanical Engineering* (1964), 1957.

Robert Dean Slonneger, M.S.M.E., *Professor of Mechanical Engineering* (1963), 1955.

Theoretical and Applied Mechanics

Edward Ford Byars, Ph.D., *Chairman and Professor of Theoretical and Applied Mechanics* (1960).
Warren George Lambert, Ph.D., *Associate Professor of Theoretical and Applied Mechanics* (1964).
James Harry McElhaney, Ph.D., *Assistant Professor of Theoretical and Applied Mechanics* (1965).
Helen Lester Plants, M.S.C.E., *Assistant Professor of Theoretical and Applied Mechanics* (1956), 1947.
Robert Wesley Shreeves, Ph.D., *Associate Professor of Theoretical and Applied Mechanics* (1961).
Robert Douglas Snyder, Ph.D., *Assistant Professor of Theoretical and Applied Mechanics* (1962).
George William Weaver, M.S.M.E., *Professor of Theoretical and Applied Mechanics* (1962), 1948.
Donald Thompson Worrell, M.S.E.E., *Professor of Theoretical and Applied Mechanics* (1955), 1941.

SCHOOL OF MINES

Charles T. Holland, M.S.E.M., *Dean of the School of Mines and Professor of Mining Engineering* (1961), 1930.
Richard Willoughby Laird, M.S.E.M., *Associate Professor of Petroleum Engineering* (1953), 1947.
Joseph Dwight McClung, M.S.E.M., *Associate Professor of Mining Engineering* (1961), 1941.
Ernest James Sandy, B.S.E.M., *Assistant Professor of Mining Engineering* (1957), 1947.
James Allen Wasson, M.S., *Assistant Professor of Petroleum Engineering* (1960).

SCHOOL OF JOURNALISM

Quintus Charles Wilson, Ph.D., *Dean of the School of Journalism and Professor of Journalism* (1961).
Paul Alexander Atkins, M.A., *Associate Professor of Journalism* (1961), 1953.
Donovan Hiner Bond, M.A., *Professor of Journalism* (1960), 1946.
Guy Harry Stewart, Ph.D., *Associate Professor of Journalism* (1960), 1949.
William Robert Summers, Jr., M.A., *Associate Professor of Journalism* (1960), 1952.
James Robert Young, M.A., *Assistant Professor of Journalism* (1954).

MEDICAL CENTER

Anatomy

William Russell Goodge, Ph.D., *Assistant Professor of Gross and Neurological Anatomy* (1961), 1957.
Cecil Gordon Hewes, Ph.D., *Associate Professor of Gross and Neurological Anatomy* (1960).
A. Curtis Higginbotham, Ph.D., *Associate Professor of Microanatomy* (1957).
Robert Joseph Johnson, M.D., *Chairman and Professor of Gross and Neurological Anatomy* (1957).
Randall William Reyer, Ph.D., *Associate Professor of Microanatomy* (1957).
T. Walley Williams, Ph.D., *Chairman and Professor of Microanatomy and Organology* (1957), 1944.

Biochemistry

Reginald Frederick Krause, M.D., Ph.D., *Chairman and Professor of Biochemistry* (1951).

William Thomas Burke, Ph.D., *Associate Professor of Biochemistry* (1961), 1960.
William James Canady, Ph.D., *Associate Professor of Biochemistry* (1962), 1958.
Edwin Charles Gangloff, Ph.D., *Assistant Professor of Biochemistry* (1955).
James Bryson Gilbert, M.D., *Assistant Professor of Biochemistry* (1963).
Frederick Jackson Lotspeich, Ph.D., *Associate Professor of Biochemistry* (1959), 1956.
Diana Amoss Robinson, Ph.D., *Instructor* (part-time) *in Biochemistry* (1963), 1959.
Damon Charles Shelton, Ph.D., *Associate Professor of Biochemistry* (1960), 1953.
George Henry Wirtz, Ph.D., *Assistant Professor of Biochemistry* (1963).

Gross and Neurological Anatomy

William Russell Goodge, Ph.D., *Assistant Professor of Gross and Neurological Anatomy* (1961).
C. Gordon Hewes, Ph.D., *Associate Professor of Gross and Neurological Anatomy* (1960).

Microanatomy and Organology

T. Walley Williams, Ph.D., *Chairman and Professor of Microanatomy and Organology* (1957), 1944.
A. Curtis Higginbotham, Ph.D., *Associate Professor of Microanatomy* (1957).
Randall William Reyer, Ph.D., *Associate Professor of Microanatomy* (1957).

Microbiology

John Madison Slack, Ph.D., *Chairman and Professor of Microbiology* (1949), 1946.
Robert G. Burrell, Ph.D., *Assistant Professor of Microbiology* (1961).
Samuel Joseph Deal, Ph.D., *Associate Professor of Microbiology* (1964), 1960.
James E. Dyson, Jr., Ph.D., *Associate Professor of Microbiology and Director of Division of Academic Communications* (1963), 1958.
Vincent Frederick Gerencser, Ph.D., *Assistant Professor of Microbiology* (1961).
John Edgar Hall, Ph.D., *Associate Professor of Microbiology* (1964), 1958.
Billy E. Kirk, Ph.D., *Assistant Professor of Microbiology* (1964).
Carmine Charles Mascoli, Ph.D., *Associate Professor of Microbiology* (1963), 1960.

Pathology

Wilhelm Stockman Albrink, Ph.D., M.D., *Chairman and Professor of Pathology* (1961).
Edward G. Stuart, Ph.D., M.D., *Associate Professor of Pathology* (1960).

Pharmacology

Daniel Thomas Watts, Ph.D., *Chairman and Professor of Pharmacology* (1953).
Thomas Dillard Darby, Ph.D., *Associate Professor of Pharmacology* (1962).
William Wright Fleming, Jr., Ph.D., *Assistant Professor of Pharmacology* (1960).
Frank Eugene Greene, Ph.D., *Instructor in Pharmacology* (1963).
Alexander Donovan Kenny, Ph.D., *Associate Professor of Pharmacology* (1959).
Robert Leo Robinson, Ph.D., *Assistant Professor of Pharmacology* (1961), 1959.
Leroy Hallowell Saxe, Jr., Ph.D., *Professor of Pharmacology* (1962), 1955.

Physiology

David Wilmarth Northup, Ph.D., *Chairman and Professor of Physiology* (1949), 1935.
Don Houston Blount, Ph.D., *Assistant Professor of Physiology* (1961).
Wilbert Eugene Gladfelter, Ph.D., *Assistant Professor of Physiology* (1961), 1959.
Hugh Alexander Lindsay, Ph.D., *Associate Professor of Physiology* (1960), 1955.
Kenneth Earl Penrod, Ph.D., *Professor of Physiology* (1959).
John Clifford Stickney, Ph.D., *Professor of Physiology* (1957), 1940.
Edward Jerald Van Liere, Ph.D., *Professor of Physiology* (1937), 1921.

Medicine

Edmund Berney Flink, M.D., Ph.D., *Chairman and Professor of Medicine* (1960).
John Joseph Lawless, M.D., Ph.D., *Associate Professor of Medicine* (1960), 1935.
Clark Kendall Sleeth, M.D., *Professor of Medicine* (1961), 1935.

SCHOOL OF PHARMACY

Raphael Otto Bachmann, Ph.D., *Dean of the School of Pharmacy and Professor of Pharmaceutical Chemistry* (1961).
Alfred Clinton Core, Ph.D., *Assistant Professor of Pharmaceutical Chemistry* (1961), 1960.
Frank Dennis O'Connell, Ph.D., *Assistant Professor of Pharmacognosy* (1957).
Albert F. Wojcik, Ph.D., *Associate Professor of Pharmacy Administration* (1963), 1945.

SCHOOL OF PHYSICAL AND HEALTH EDUCATION, RECREATION, AND SAFETY

Ray Oscar Duncan, Ed.D., *Dean of the School of Physical and Health Education, Recreation, and Safety and Professor of Physical Education* (1952).
W. Quentin Barnette, M.A., *Assistant Professor of Physical Education* (1958), 1950.
Charity White Beto, M.S., *Associate Professor of Physical Education* (1957), 1946.
Kittie Jean Blakemore, M.S., *Assistant Professor of Physical Education* (1964), 1960.
William Alfred Bonsall, M.S., *Assistant Professor of Physical Education* (1958), 1950.
Wincie Ann Carruth, Ph.D., *Chairman of Women's Physical Education and Professor of Physical Education* (1957).
Phillip Barnard Donley, B.S., Certified Physical Therapist, *Instructor in Physical Education* (1960).
Albert C. Gwynne, M.S., *Assistant Professor of Physical Education* (1946), 1934.
Stephen Harrick, M.A., *Associate Professor of Physical Education* (1955), 1924.
John William Hesen, M.D., *Assistant Professor of Physical Education* (1959), 1957.
Frederick John Holter, Ph.D., *Chairman of Health Education and Graduate Studies and Professor of Physical Education* (1948), 1947.
Beatrice Hurst, M.A., *Associate Professor of Physical Education* (1951), 1928.
Joseph M. Hutchison, Jr., M.S., *Assistant Professor of Recreation* (1961), 1954.
George Smith King, Jr., M.S., *Instructor in Physical Education* (1960), 1958.
S. Samuel Maurice, M.S., *Assistant Professor of Physical Education* (1958).
Stanley Edward Romanoski, M.S., *Instructor in Physical Education* (1957).
John Gustave Scherlacher, M.Ed., *Chairman and Professor of Recreation* (1960), 1947.
John Semon, M.S., *Chairman of Department of Physical Education for Men and Associate Professor of Physical Education* (1955), 1943.
Patrick Anthony Tork, M.S., *Professor of Physical Education* (1953), 1943.
Mary Kathryne Wiedebusch, B.S., *Instructor in Physical Education* (1955).
Charles Peter Yost, Ph.D., *Chairman of Safety Education and Professor of Physical Education* (1958), 1946.

REHABILITATION COUNSELING

George Samuel Brown, M.S., *Coordinator, Rehabilitation Counseling* (1960).
Sheldon Canfield Downes, M.S., *Assistant Coordinator, Rehabilitation Counseling* (1962).

GRADUATE FACULTY MEMBERS IN EXTENSION

Roman Joseph Verhaalen, Ph.D., *Dean of Extension Services* (1964).
Elizabeth Jane Goodall, M.A., *History* (1945).
Francis Hill McClung, M.S., *Assistant Professor of Education* (1956).
James William Wright, M.A., *Sociology* (1947).
Carl P. Cummings, M.A., *Mathematics* (1963).

Part IV
COURSES OF STUDY

ABBREVIATIONS

I—a course given in the first semester.
II—a course given in the second semester.
I, II—a semester course given in each semester.
I and II—a course given throughout the year.
S—a course given in the Summer Session.
hr.—number of credit hours per course.
rec.—recitation period.
lab.—laboratory period.
conc:—concurrent registration required.
PR:—prerequisite.
consent—consent of instructor required.
NOTE: Summer courses carry the same credit value as courses offered in the regular semesters.

PLAN FOR NUMBERING COURSES

Courses 200 to 299—Courses open to graduate and upper-division undergraduate students.
Courses 300 to 399—Courses open to graduate students only.

AGRICULTURE

AGRICULTURE

The Degree of Master of Agriculture

Students who seek the degree of Master of Agriculture must hold the degree of bachelor of science in agriculture, or its equivalent, from an approved institution. The program of study leading to this degree is arranged to insure diversification along broad general lines rather than specialization in a single field of subject matter. Course work in at least five such fields must be included and a problem report carrying not more than three semester hours of credit is required. A minimum total number of 30 hours, including the three hours for the problem report, is required. Subject matter fields are those listed in the *Announcements* of the College of Agriculture, Forestry, and Home Economics.

AGRICULTURE

360. Problem Report for the Degree of Master of Agriculture. I, II, S. 1-3 hr.

AGRICULTURAL BIOCHEMISTRY*

Work for the degree of Master of Science consists chiefly of course offerings selected according to the special needs of the students from 200 and 300 courses in the basic and biological sciences. A total of no fewer than 30 hours of graduate credit is required of which no more than 6 may be for thesis or research. A thesis is required.

*See also the course offerings in medical biochemistry, chemstry, botany, and zoology.

Candidates for the master of science degree with a major in agricultural biochemistry should have training in general chemistry, analytical chemistry, organic chemistry, physical chemistry, and biochemistry. All beginning graduate students who expect to become candidates for an advanced degree must take examinations in the above fields of chemistry during the week preceding their first registration. Deficiencies demonstrated by these examinations are to be removed by satisfactory completion of an approved course in that subject-matter area.

The Degree of Doctor of Philosophy

Applicants for the degree of doctor of philosophy must have an M.S. or M.A. degree and pass comprehensive written and oral examinations in biochemistry and one or two minor fields. The applicant does not become a candidate for the degree until he has successfully passed the language examinations and the comprehensive examinations. These examinations must be passed one academic year before the degree is conferred.

Opportunities for Research

An active research program is in operation in the department. Problems in the fields of nutrition, proteins, the chemistry of microorganisms, and carbohydrates are currently being investigated. The laboratories are well equipped and adequate to accommodate additional graduate students. Several graduate assistantships are available each year.

202. Introductory Biochemistry. II. 3 hr. PR: General chemistry, organic chemistry. Open to Education majors and Master of Agriculture candidates only.

212. Principles of Biological Radionuclide Science. S. 3 hr. This course is designed for high school science teachers and deals with the handling and usage of radionuclides in research, both for peaceful and wartime uses.

214. Biological Radionuclide Methods. I. 3 hr. PR: Chem. 1, 2, 131, or consent. Radionuclide methods and isotope handling as needed by students interested in biological research. Offered in Fall of even years.

290. General Biochemistry. I. 3 hr. PR: Chem. 238, quantitative analysis and consent. A general course in biochemistry primarily intended to meet the needs of graduate students.

291. General Biochemistry. II. 3 hr. PR: Agr. Biochem. 290 or consent. A continuation of Agr. Biochem. 290.

293. Laboratory Experiments in Biochemistry. I. 2 hr. PR or conc: Agr. Biochem. 290. Experiments to demonstrate certain phases of the subject matter covered in General Biochemistry.

301. Enzymes. II. 3 hr. PR: Agr. Biochem. 290 or consent. A general survey of the chemistry enzymes for the advanced student. Offered in Spring of odd years.

303. Biochemistry of Carbohydrates. II. 2 hr. PR: Agr. Biochem. 291. The structure, properties and metabolism of sugars and polysaccharides. Offered in 1966 and in Spring of even years thereafter.

305. Biochemistry of the Lipids. I. 2 hr. PR: Agr. Biochem. 290 or consent. A consideration of the composition, analysis, processing, and metabolism of fats and other lipids. For advanced students. Offered in Fall of even years.

308. Vitamins. I. 2 hr. PR: Biochem. 101, 290, and 291 or consent. Identification, nomenclature and chemical structures, biochemical systems, biogenesis, pathology and requirements of vitamins and vitamin like compounds. Offered in Fall of odd years.

NOTE: Students assigned to a 200 course for graduate credit will be required to prepare a semester paper on some special phase of the course in addition to the regular course work.

320. Special Topics. I, II, S. 2-4 hr. Advanced training will be provided through literature surveys and special research projects, in such areas as biochemical techniques, animal nutrition and metabolism.

325. Advanced Biochemistry Laboratory. I. 2 hr. PR: Agr. Biochem. 290, or concurrent registration. Methods and techniques in the study of proteins and related subjects, including principles of fractionation, electrophoresis, ion exchange, lyophilization, microbiological analysis, and other applicable techniques. Offered in Fall of odd years.

326. Advanced Biochemistry Laboratory. II. 2 hr. PR: Agr. Biochem. 290. Special techniques used in the study of lipids, enzymes, and carbohydrates, such as distillation at low pressure, low temperature fractional crystallization, counter current distribution, purification of enzymes, kinetic studies, and glass blowing. Offered in Spring of odd years.

330. Mineral Metabolism. I. 3 hr. PR: Chem. 1, 2, 31; Biochem. 290-291, or consent. The inorganic and biochemistry of the minerals in the body and the physiological function of minerals are studied. A special term paper is required of each student on the mineral metabolism studies. Offered in Fall of even years beginning in 1966.

350. Seminar. I, II. 1 hr. per sem.

380. Research. I, II. 1-15 hr. per sem.

AGRICULTURAL ECONOMICS

The Department offers major work for the Degree of Master of Science in Agricultural Economics. A student desiring to take work leading to a master's degree in agricultural economics must have earned a bachelor's degree and present at least 12 hours of undergraduate credit in courses in principles of economics, agricultural economics, farm management, marketing, rural sociology, or related subjects. In general, when a thesis is offered, the program will consist of 24 hours or more of course work and 1 to 6 hours of thesis or research. A suitable number of hours of course work may be substituted for a thesis, bringing the program to a minimum of 30 hours. At least 9 hours of approved course work will be required in the field of general economics.

200. Land Economics. II. 3 hr. Classification, development, tenure, use, conservation, valuation and taxation, of rural, urban, mineral, forest, water, and recreational land resources.

206. Farm Planning. I. 3 hr. PR: Senior standing. Principal factors influencing returns on farms; planning use of labor, soil, crops, livestock, buildings and equipment. Farm visits required.

230. Cooperative Marketing. II. 2-3 hr. PR: Agr. Econ. 103. Principles and practices of cooperation as applied to marketing of agricultural products and purchasing of farm supplies. Offered in Spring of even years.

235. Marketing Dairy Products. II. 2 hr. PR: Agr. Econ. 103. Milk-marketing policies and practices, including milk-market orders. Offered in Spring of odd years.

240. Agricultural Prices. II. 3 hr. An analysis of the price-making forces which operate in the market places for the major agricultural commodities.

261. Agri-business Finance. I. 3 hr. Credit needs of agricultural businesses; financing farm and market-agency firms; and organization and operation of credit agencies which finance agricultural business firms.

271. Agricultural Policy. II. 3 hr. An examination of the economic aspects of government price programs, production and marketing controls, subsidies, parity, export and import policies, and other programs affecting agriculture.

320. Special Topics. I, II, S. 2-4 hr. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; maximum credit, 6 hr.).

340. Advanced Farm Management. I. 3 hr. PR: Agr. Econ. 206.

341. Production Economics. I. 3 hr. Economic principles of production with special application to agriculture.

342. Advanced Agricultural Economics. II. 3 hr.

380. Research. I and II. 1-6 hr. per sem.

STATISTICS

211. Statistical Methods. I. 3 hr. Statistical concepts and methods applied to data in biological and other fields. Measures of centrality and dispersion; normal distribution; population and sampling; estimation and tests of hypotheses concerning means and variances, analysis of variance, regression and correlation; enumeration statistics.

212. Advanced Statistical Methods. II. 3 hr. PR: Statistics 211 or equiv. Continuation of Statistics 211. Statistical concepts and methods. Analysis of variance with two or more variables; factorial comparisons; covariance analysis; multiple regression and correlation; and nonlinear regression.

320. Special Topics. I, II, S. 2-4 hr. PR: Consent. Advanced study in such topics as analysis of non-orthogonal data, estimation of variance and covariance components, transformations for anormality of distribution, efficiency of experiments, and non-parametric methods of estimation.

AGRICULTURAL EDUCATION

Candidates for the Master of Science Degree with major in Agricultural Education must have done satisfactory work as undergraduates. The student's candidacy must be approved by the chairman of the department. Candidates for the master's degree in agricultural education must have fulfilled the requirements for B.S. Agr. at West Virginia University or at an approved institution offering an equivalent degree. Also, the candidate must have completed a minimum of 20 hours in education and 50 hours in agriculture.

Students shall combine graduate courses in agriculture and in education by taking 16 to 20 hours in agriculture and 10 to 14 hours in education. A minimum of 5 hours shall be in professional courses dealing with agricultural education. All graduate courses offered toward a degree must have prior approval of the adviser. The student and the adviser shall arrange a specific curriculum to be pursued for the degree at the beginning of the graduate program. A thesis or problem is required as a part of the 30 hours for graduation.

Students shall complete in residence 15 hours of course work after having completed one or more years of teaching vocational agriculture. This shall apply unless the student has been granted permission by the Department to complete his graduate work without teaching experience.

Ed. 276. Teaching Young and Adult Farmer Classes. I, S. 2 hr. PR: Ed. 105, 106. Participation in conducting young and adult farmer classes and school-community food preservation center; organization, course of study, method of teaching and supervision of the classes, young farmers' associations, adult farmers' organizations in classes.

Ed. 277. Organizing and Directing Supervised Farming Programs. I, S. 2 hr. PR: Ed. 160 or consent. Planning programs of supervised farming and supervised occupational experience, supervising and evaluating such programs for day students, young and adult farmer classes and groups.

Ed. 318. Planning Programs and Courses for Vocational Agriculture Departments. S. 2 hr. PR: Ed. 124, 160. Gathering data, studying the farming problems of day students, young farmers and adult farmers, and formulating total programs for school communities.

239. Program Building in Agricultural Extension. II. 3 hr. PR: Agr. Educ. 134, 138, or consent. Rural organization in relation to program building. Leadership and group action. Over-all working and educational objectives. Principles, methods, and goals in developing county extension programs.

320. Special Topics. I, II, S. 1-4 hr. (For the Master's Degree, Special Topics ordinarily may count for 2 to 4 hr.; maximum credit, 6 hr.).

360. Problem. I, II, S. 1-3 hr. (For the Master's Degree).

350. Seminar. I, II, S. 1 hr.

380, 381. Research. I and II. S. 1-6 hr. per sem., or session.

AGRICULTURAL ENGINEERING

See page 146.

AGRICULTURAL MECHANICS

Graduate study in Agricultural Mechanics is offered as a minor for Master of Science Candidates majoring in other fields and to candidates seeking the Master of Agriculture Degree.

252. Advanced Farm Mechanics. II. 3 hr. PR: Agr. Mech. 152. Forging, cold-iron work, tool fitting, woodworking. Offers training for teaching shop work in rural high schools. 1 hr. rec., 6 hr. lab.

253. Advanced Farm Machinery. II. 3 hr. PR: Ag.E. 10. Performance of agricultural equipment including calibration, efficiency, adjustments, and maintenance. Theoretical and practical aspects of selection based on economics, compatibility of machines with other equipment and the farming operation, service, and factors of custom operation. 2 hr. rec., 3 hr. lab.

254. Farm Maintenance and Construction Welding. II. 3 hr. PR: Ag.E. 10. Characteristics and properties of metals used in farm machinery and equipment. Machinery repair, including oxacetylene cutting and welding. AC and DC electric. 1 hr. rec., 6 hr. lab.

259. Farm Structures. I. 3 hr. PR: Ag.E. 10. Fundamentals of construction, functional requirements, materials, new equipment, and use of laborsaving ideas and machinery. 2 hr. rec., 3 hr. lab.

270. Electricity in Agriculture. I. 3 hr. PR: Ag.E. 10. The study of the fundamentals of electrical energy and its application to lighting, power, heating, and control circuits used in agriculture. 2 hr. rec., 3 hr. lab.

275. Agricultural Engines. II. 3 hr. PR: Ag.E. 10. Relation of theory to design and operation of internal combustion engines with emphasis on care, operation, and maintenance. Study covers one, two, three, four, six, and eight cylinder engines, both in two and four stroke designs. 2 hr. rec., 3 hr. lab.

320, 321, 322, 323. Special Topics. I, II, S. 2-4 hr. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; maximum credit, 6 hr.).

380, 381. Research. I and II. 1-6 hr. per sem.

AGRONOMY AND GENETICS

The Department of Agronomy and Genetics offers major work for the degrees of Master of Science and Doctor of Philosophy in the fields of crops, soils, and genetics, and minor work for students in other fields.

Adequately equipped laboratories and greenhouses are provided. The Agronomy Farm and substation are available for certain types of investigational work.

To enter upon graduate work the student should have basic courses in the physical and biological sciences in addition to basic courses in agronomy and genetics. Students who have not had such courses will be required to take these without credit early in their graduate work. In addition to courses in their major field, students will be expected to acquire training in one or more related minor fields, the nature of the courses selected depending on their particular field of interest. Research will deal with problems of soil science, crop science, or genetics. A thesis or problem report is required for the M.S. degree.

AGRONOMY (Crop Science)

251. Weed Control. I. 3 hr. PR: Agr. 52 and Agron. 2 or consent. Fundamental principles of weed control. Recommended control measures for and identification of common weeds. 2 lec., 1 lab.

252. Grain and Special Crops. II. 3 hr. PR: Agr. 52 and Agron. 2 or consent. Advanced study of methods in the production of grain and special crops. Varieties, improvement, tillage, harvesting, storage, and uses of crops grown for seed, or special purposes. Offered in Spring of odd years.

254. Pasture and Forage Crops. II. 4 hr. PR: Agr. 52 and Agron. 2 or consent. All phases of pasture and forage crop production, including identification, seeding, management, use, seed production, and storage of forage crops. 3 lec., 1 lab.

AGRONOMY (Soil Science)

210. Fertilizer and Soil Fertility. I. 3 hr. PR: Agron. 2 or 10. Soil properties in relation to fertility and productivity of soils; evaluation of soil fertility; production of fertilizers and their use in increasing the fertility and productivity of soils.

212. Soil Management. II. 3 hr. PR: Agron. 2 or 10. Using soil technology to solve soil management problems relating to cropping systems. Field diagnosis of soil problems will be stressed. Two half-day visits. Offered in Spring of odd years.

216. Soil Genesis and Classification. II. 3 hr. PR: Agron. 2 or 10. Origin and formation of soils. Study of soil profiles and soil forming processes in the fields and laboratory. Principles of classification and techniques of soil mapping. 2 lec., 1 lab. Offered in Spring of even years.

230. Soil Physics. I. 3 hr. PR: Agron. 2 or 10. Physical properties of soils, water and air relationships and their influence on soil productivity. Offered in Fall of odd years. 2 lec., 1 lab.

316. Soil Chemistry. I. 3 hr. PR: Consent. Fundamental chemical properties of soils in relation to plant growth; nature and properties of soil colloids; base exchange and soil acidity; availability of plant food elements and soil-plant interrelationships. Offered in Fall of odd years.

AGRONOMY (Crop and Soil Science)

320, 321, 322, 323. Special Topics I, II, S. 2-4 hr. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; maximum credit, 6 hr.).

350, 351, 352, 353. Seminar. I, II. 1 hr. per sem. Recent literature pertaining to soil and crop production.

380, 381, 382, 383. Research. I, II. 1-15 hr. per sem.

GENETICS

220. Crop Breeding. II. 3 hr. PR: Gen. 171 or 221. Methods and basic scientific principles involved in the improvement of leading cereal and forage crops through hybridization and selections. Offered in Spring of odd years.

221. Basic Concepts of Modern Genetics. I. 3 hr. PR: 8 hr. of biological science and 1 year of chemistry. Independent inheritance, linkage. Chemical nature of genetic material. Control of phenotype by genetic material. Gene action and coding of genetic material.

224. Human Genetics. II. 3 hr. PR: Gen. 171 or 221 or consent. A study of the genetic system responsible for the development of phenotype in man. Offered in Spring of odd years.

320. Special Topics. I, II, S. 2-4 hr. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; maximum credit, 6 hr.).

324. Cytogenetics. II. 4 hr. PR: Gen. 171 or 221 and Biol. 152 or 221 or consent. Cytogenetics of genomes and chromosome morphology and the evolution of these. Offered in Spring of even years.

326. Advanced Physiological Genetics. II. 3 hr. PR: Gen. 171 or 211 and Organic Chem. Physiological and biophysical concepts of genetic material. Structure and arrangement of genetic units. Nucleic acids as carriers of genetic information. Gene action and amino acid coding. Biochemical evolution of genetic material. Offered in Spring of odd years.

350. Seminar. I, II. 1 hr. per sem. Recent literature pertaining to breeding, genetics, and cytology.

380. Research. I, II. 1-15 hr. per sem.

BACTERIOLOGY

314. Soil Microbiology. II. 4 hr. PR: Agron. 2 and Bact. 141. Occurrence of microorganisms in soils and their relationship to decomposition of organic matter, availability of plant nutrients, and soil acidity; technique of isolation and study.

ANIMAL INDUSTRY AND VETERINARY SCIENCE

320. Special Topics. I, II, S. 1-4 hr. (1 hr. credit in special cases only). Advanced study in particular phases of such animal industry topics as animal production, nutrition, physiology, breeding and genetics, veterinary science, and food science. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; maximum credit, 6 hr.).

370. Methods of Animal Research. I. 3 hr. Design, experimental procedures, and analyses used in research in the several areas of animal industry. Offered in Fall of odd years.

ANIMAL BREEDING AND GENETICS

212. Breeding and Incubation: Principles and Practices. I. 3 hr. (1 lab.). PR: Gen. 221 or consent. Study of methods available for improving and reproducing meat and egg quality. Offered in Fall of even years.

226. Breeding of Farm Animals. II. 3 hr. PR: Gen. 221 or consent. The application of principles of quantitative population genetics to the improvement of farm animals.

326. Advanced Animal Selection. II. 3 hr. PR: Stat. 212 and Gen. 221 or equiv. An advanced course dealing with the basic concepts of experimental and statistical approaches in the analysis of quantitative inheritance with special reference to the magnitude and nature of genotypic and non-genotypic variability. Offered in Spring of even years.

350. Seminar. I, II. 1 hr. per sem.

380. Research. I, II. 1-15 hr. per sem. For graduate students working on a problem in preparation of a thesis.

ANIMAL NUTRITION

295. Principles of Nutrition and Metabolism. I. 3 hr. PR: Agr. Biochem. 101, An. Physiol. 100, or equiv. A basic course in animal nutrition.

296. Principles of Nutrition and Metabolism. II. 3 hr. PR: An. Nutr. 295. A continuation of An. Nutr. 295. A basic course in animal nutrition.

297. Nutrition Laboratory Methods. I. 2 hr. PR: An. Nutr. 295 or concurrent registration in Agr. Biochem. 103. Quantitative chemical, physical, and microbiological methods used in animal nutrition research. Offered in Fall of even years.

298. Nutrition Laboratory Methods, Animal Techniques. II. 2 hr. PR: An. Nutr. 297. Laboratory experiments in sampling, digestibility determinations, nutritional balance studies, bioassay, and experimental surgery. Offered in Spring of odd years.

308. Advanced Nutrition and Metabolism. II. 3 hr. PR: An. Nutr. 296 or consent. Advanced treatment of the nutrition, metabolism, nutrient interrelationship and metabolic regulatory mechanisms of domestic animals. Offered in Spring of odd years.

310. Nutrition and Physiology of the Ruminant. II. 3 hr. PR: Physiol. 100; An. Nutr. 101; Agr. Biochem. 290. A study of the nutrition and physiological processes peculiar to the ruminant animal. Offered in Spring of even years.

311. Problems In Nutritional Physiology. I. 3 hr. PR: An. Nutr. 296 or consent. Consideration of the interrelation of nutrition with growth, reproduction, environment, disease and related areas. Offered in Fall of odd years.

350. Seminar. I, II. 1 hr.

380. Research. I, II, S. 1-15 hr. per sem. For graduate students working on a problem in preparation of a thesis.

ANIMAL PHYSIOLOGY

225. Reproduction of Farm Animals. II. 3 hr. PR: Zool. 2 or consent. The anatomy and physiology of reproduction in farm animals.

227. Milk Secretion. II. 3 hr. (1 lab.). PR: Chem. 131; An. Physiol. 225. The evolution, anatomy, and growth of the mammary gland. The chemical hormonal, physiological and environmental factors affecting lactation. Offered in Spring of odd years.

350. Seminar. I, II. 1 hr.

380. Research. I, II. 1-15 hr. per sem. For graduate students working on a problem in preparation of a thesis.

NOTE: Students are also referred to Psych. 201, Physiological Psychology; Zool. 171, Human Physiology; Zool. 273, 274, Cellular Physiology; and Zool. 276, Comparative Physiology.

ANIMAL PRODUCTION

201. Advanced Poultry Production. I. 3 hr. PR: An. Prod. 103 or An. Nutr. 101. Special phases of broiler and egg production, disease control, laborsaving studies, recent designs in building and heating equipment for all types of poultry. Offered in Fall of even years.

*222. Milk Production. II. 4 hr. (1 lab.). Feeding and management of dairy cattle.

223. Advanced Livestock Production. I. 3 hr. (1 lab.). PR: An. Nutr. 101 and consent. Phases of beef production involving problem work in specialized commercial and purebred fields, including processing.

224. Advanced Livestock Production. II. 3 hr. (1 lab.). PR: An. Nutr. 101 and consent. Special studies in wool and market-lamb production and processing. Offered in Spring of even years.

330. Advanced Milk Production. II. 3 hr. PR: An. Nutr. 101 or consent. Advanced study of the feeding, breeding, and management of dairy cattle. Offered in Spring of odd years.

350. Seminar. I, II. 1 hr.

380. Research. I, II, 1-6 hr. per sem. For graduate students working on a problem in preparation of a thesis.

*Transportation for required trips in connection with these courses will generally be supplied by the College. Students will be responsible for their meals and lodging.

FOOD SCIENCE

*202. Advanced Meats. II. 3 hr. (2 labs.). PR: Food Sci. 167. Studies covering composition of meat, complete fabrication of meat animal carcasses, factors influencing yield, physiology and chemistry of pertinent phenomena, and merchandising of meat. Offered in Spring of even years.

232. Advanced Dairy Technology. II. 4 hr. (2 labs.). Study of the effect of major milk constituents on properties of dairy products and study of analytical methods used in quality and composition control of dairy products. Offered in Spring of odd years.

312. Critical Evaluation of Recent Research and Developments in Dairy Foods. I. 4 hr. (2 labs.). PR: Consent. Normally a minimum of Bact. 246 and at least one Dairy Foods course will be required. Methods, results and impact of recent research and developments pertaining to dairy food industry. Offered in Fall of even years.

350. Seminar. I, II. 1 hr.

380. Research. I, II. 1-6 hr. per sem. For graduate students working on a problem in preparation of a thesis.

VETERINARY SCIENCE

206. Parasites and Pathology. II. 3 hr. PR: Zool. 2 or equiv. Common parasites of farm animals, their control, and their effect upon the host. Offered in Spring of odd years.

350. Seminar. I, II. 1 hr.

380. Research. I, II. 1-6 hr. per sem. For graduate students working on a problem in preparation of a thesis.

HORTICULTURE

The candidate for the degree of Master of Science should offer a minimum of 30 semester hours properly distributed among the related sciences and his major field.

Departments offering graduate courses of special interest and value to students of horticulture are: botany, chemistry, genetics, soils, plant pathology, economics, education, and entomology. A thesis is required.

204. Plant Propagation. II. 3 hr. A study of the practices of plant propagation and the factors involved in reproduction in plants.

229. Landscape Design. I. 3 hr. (1 lec. 1 scheduled lab., 1 arranged lab.). A course in ornamental horticulture giving an appreciation of the basic principles of design and information pertaining to the use and care of ornamental plants around the home.

240. Horticulture Theory and Procedure I—Tree-Fruits and Small-Fruits. I. 4 hr. (two 2-hr. lectures). PR: Agr. 52, Hort. 107, or consent. A study of the principles and operations involved in the production of fruits.

241. Horticulture Theory and Procedure II—Vegetables and Handling and Storage. II. 4 hr. (Two 2-hr. lectures). PR: Agr. 52, Hort. 107, or consent. Principles of vegetable production. Physiology, handling, and storage of perishable horticultural commodities.

320. Special Topics. I, II, S. 2-4 hr. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; maximum credit, 6 hr.).

380. Research. I, II, S. 1-6 hr. per sem. (Maximum credit, 6 hr.).

*Transportation for required trips in connection with these courses will generally be supplied by the College. Students will be responsible for their meals and lodging.

PLANT PATHOLOGY, BACTERIOLOGY, AND ENTOMOLOGY

Candidacy. Graduate students in Plant Pathology, Bacteriology, or Entomology must hold a Bachelor's Degree from an approved college. To enter upon graduate work without condition in these fields, the student must have passed satisfactorily not less than 32 hours in biology. Additional undergraduate work in chemistry, physics, mathematics, or botany may be required according to the needs of the field of specialization followed by the student. Admission to candidacy is conditioned upon a suitable period in residence and a demonstrated ability to do work of graduate caliber.

Course requirements. A candidate for the Master's Degree in Plant Pathology, Bacteriology, or Entomology must pass satisfactorily 30 credits of approved work of which 6 may be for a thesis. A thesis is required.

The doctorate is offered only in Plant Pathology and Agricultural Microbiology and candidates for these degrees are governed by the general regulations of the Graduate School.

AGRICULTURAL BACTERIOLOGY

247. Food Microbiology. I. 4 hr. PR: Bact. 141, organic chemistry or consent. The ecology and physiology of microorganisms important in the manufacture and deterioration of foods, and the techniques for the microbiological examination of foods. Offered in Fall of even years.

248. Sanitary Bacteriology. I. 3 hr. PR: Bact. 141. Standard bacteriological methods used in routine examination of water sewage. Offered in Fall of odd years.

314. Soil Microbiology. II. 4 hr. PR: Bact. 141 and organic chemistry. Occurrence and distribution of microorganisms in soils and their interrelationships. Their role in decomposition of organic matter and other transformations of soil constituents. Offered in Spring of odd years.

320, 321, 322, 323. Special Topics. I, II, S. 2-4 hr. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; maximum credit. 6 hr.).

350, 351. Seminar. I, II. 1 hr. per sem.

380, 381, 382, 383. Research. I, II, S. 1-6 hr. per sem.

ENTOMOLOGY

202. Agricultural Entomology. II. 4 hr. PR: Zool. 1, 2. A course dealing with the basic aspects of insect life, emphasizing the study of economically important insects and their control. Designed to meet the needs of students in agriculture. Does not carry graduate credit for majors in Entomology.

203. Economic Entomology. II. 3 hr. PR: Entom. 202. Evaluation of insect control problems; study of survey and control methods; equipment; insecticides. Offered in Spring of odd years.

313. Insect Transmission of Plant Diseases. I. 3 hr. PR: Pl. Path. 153, 201, or Entom. 202. Role of insects in spread and development of plant diseases. Offered in Fall of odd years.

320, 321, 322, 323. Special Topics. I, II, S. 2-6 hr. PR: Entom. 202. Advanced study of entomological topics of special interest to the student.

350, 351. Seminar. I, II. 1 hr. per sem.

380, 381, 382, 383. Research. 1, II, S. 1-6 hr.

PLANT PATHOLOGY

201. General Plant Pathology. I. 4 hr. PR: Bact. 141. Nature and causes of plant diseases; methods of control.

202. Principles of Plant Pathology. II. 4 hr. PR: Bact. 141 and either Pl. Path. 152, 201, or 203, or consent. Primarily for graduate students and seniors majoring in botany, biology, or agricultural science. Nature of diseases in plants with practice in laboratory methods. Offered in 1965-66 and alternate years.

203. Mycology. I. 4 hr. Lectures, field and laboratory studies of parasitic and saprophytic fungi.

204. Diseases of Fruit Crops. I. 2 hr. PR: Pl. Path. 201. The important diseases of commercial fruits. Causes and methods of control. Offered in Spring of even years.

205. Diseases of Ornamentals. II. 2 hr. PR: Pl. Path. 201 or 153. The important diseases of ornamentals. Causes and methods of control. Offered in Spring of even years.

206. Diseases of Vegetable Crops. II. 2 hr. PR: Pl. Path. 201. The important diseases of potatoes and vegetable crops. Causes and methods of control. Offered in Spring of odd years.

207. Diseases of Field and Forage Crops. II. 2 hr. PR: Pl. Path. 201. The important diseases of cereals, legumes, and grasses. Causes and methods of control. Offered in Spring of odd years.

209. Nematology. I. 3 hr. PR: Pl. Path. 201 or consent. Primarily for graduate students majoring in the agricultural sciences, zoology, or botany. Nematode taxonomy, bionomics, and control, with particular emphasis on plant parasitic forms. Offered in Fall of even years.

313. Insect Transmission of Plant Diseases. I. 3 hr. PR: Pl. Path. 153, 201, or Entom. 202. Role of insects in spread and development of plant disease. Offered in Fall of odd years.

315. Advanced Forest Pathology. II. 3 hr. PR: Pl. Path. 203 and either Pl. Path. 153 or Pl. Path. 201. Principles, substance, and application of our knowledge of tree diseases and decays, especially as they may be related to forest management practices. Offered in Spring of even years.

320, 321, 322, 323. Special Topics. I, II, S. 2-4 hr. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; maximum credit, 6 hr.).

330. Physiology of the Fungi. II. 4 hr. PR: Organic chem., mycology, and bact., or consent. Physiological aspects of growth, reproduction, and parasitism of fungi, with emphasis on nutrition, environment, and other biotic factors.

340. Taxonomy of the Fungi. I. 3 hr. PR: Pl. Path. 203. Collection and identification of fungi, with emphasis upon those of economic importance. Offered in Fall of even years.

350, 351. Seminar. I, II. 1 hr. per sem.

380, 381, 382, 383. Research. I, II, S. 1-16 hr. per sem.

FORESTRY

The Degree of Master of Science in Forestry

Graduate students in Forestry must have completed a four-year forestry curriculum and hold a Bachelor's Degree from an approved college.

A candidate for the Master of Science in Forestry Degree must pass satisfactorily 30 credits of approved work, of which 6 may be for a thesis. A thesis is required.

217. Forest Management Plans. II. 2 hr. PR: For. 123. Analyses of forest management plans. Construction of a sustained yield timber management plan for a specific forest tract.

222. Forest Mensuration. II. 3 hr. PR: For. 21. The measurement of growth and yield; statistical methods applied to forest measurement problems.

232. Mechanical Properties of Wood. I. 3 hr. PR: T.A.M. 102. Properties and behavior of wood as a structural material.

311. Environmental Relationships in Hardwood Forests. I. 3 hr. PR: For. 112. The study of environmental factors affecting establishment, composition, and growth of hardwood forests.

312. Silvicultural Practices for Hardwood Forest Types. II. 3 hr. PR: For. 112, 116. Designing proper silvicultural systems for managing Appalachian hardwood stands; reconstructing stand histories, recognizing problems, and prescribing appropriate silvicultural treatment.

315. Advanced Forest Regulation. I, II. 2 hr. PR: For. 123 or equiv. An intensive study of area and volume regulation suitable for applied forestry in the United States.

320, 321. Special Topics. I, II. 2-4 hr. per sem. Consent. (For the Master of Science Degree, Special Topics ordinarily may count 2 to 4 hours; maximum credit, 6 hr.).

350, 351. Seminar in Silviculture. I, II. 1 hr. per sem.; maximum credit, 4 hr. PR: Consent. Reports and discussions of recent research in fundamental and applied phases of silviculture with emphasis on hardwood forest types.

380, 381, 382. Research. I, II, S. 1-6 hr. per sem. PR: Consent. For graduate students working on a thesis problem.

HOME ECONOMICS

The Degree of Master of Science in Home Economics Education

Candidates for the Master's Degree in Home Economics Education must have fulfilled the requirements for a B.S.H.E. Degree at West Virginia University or at an approved college offering an equivalent degree. In addition, the candidate must have completed a minimum of 14 hours in Education and 36 hours in Home Economics as an undergraduate.

The required curriculum leading to the Degree of Master of Science in Home Economics Education is as follows:

Option A or B		Option C	
Education	10-20 hr.	Education	10-20 hr.
Home Economics	10-20 hr.	Home Economics	10-20 hr.
(Problem or Thesis required)		A minimum of work outside the field of education	10 hr.
Tributary Fields	0-10 hr.		
Total	30 hr.	Total	36 hr.

Those electing to obtain the Master's Degree by Option C shall be required to take comprehensive written examinations. These examinations shall be furnished by:

1. Each of two or three staff members in the major area. Each examination will require approximately two hours to answer (a total of 4 to 6 hours).
2. Each of two members of the staff in minor fields. These examinations will require one and one-half hours to answer (a total of 3 hours).

Candidates for advanced degrees must declare their intentions of working toward an advanced degree and petition for admission to candidacy after having completed 10 hours of graduate work on the West Virginia University campus with no more than six hours in extension or by transferred credit or both.

Any candidate undertaking to write a problem report or a thesis must enroll in Home Econ. 309.

Whenever a candidate enrolls for courses offered through the West Virginia University Extension Division, she shall do so on the basis of having obtained prior written approval from her adviser.

Whenever a candidate elects work in another institution with the expectation of transferring the credit to West Virginia University, she shall do so only with the approval of her adviser and the Dean of the Graduate School, well in advance of matriculation for such work.

A minimum of 6 hours shall be taken in courses open to graduate students only, that is, courses in the 300 series. These shall be in addition to Ed. 360 or Ed. 361.

Qualifying examinations may be required of students who come to West Virginia University for graduate work for the first time.

No student may receive the M.S.H.E.Ed. Degree who does not have a 3.0 (B) average in the major field.

The Degree of Master of Science of Home Economics

Students who seek the degree of Master of Home Economics must have fulfilled the requirements for the degree of Bachelor of Science in Home Economics or for the Bachelor of Arts with a major in home economics at West Virginia University or at an approved institution offering an equivalent degree.

The curriculum is planned to meet the needs of those who wish training beyond the bachelor's degree in order to be better qualified for the professional work. It provides for breadth of training rather than for specialization in a narrow subject-matter area.

To insure breadth of training, students enrolled in this curriculum shall take work in at least five subject-matter areas in home economics, with a maximum of 10 credit hours in any one field. A maximum of 10 credit hours may be taken in other colleges at the University.

The student shall plan her work in advance with the help of her adviser, selecting courses which will help her perform better the work which she plans to do. Prior approval must be obtained from the adviser for all courses offered in fulfillment of degree requirements, whether they be taken in residence or by extension.

For the Master of Home Economics degree the subject-matter fields shall be those listed in the *Announcements* of the College of Agriculture, Forestry, and Home Economics. At present these fields are: food and nutrition, institution management, textiles and clothing, housing and design, child development and family relations, home management and family economics, and home economics education.

The Degree of Master of Science in Home Economics With a Major in Child Development

This program is designed to permit students to do advanced study and original research in the field of child development. Students pursuing this program should be competent to direct nursery schools.

To enter this program the student must have a baccalaureate degree from an approved institution with sufficient background in child development, family life, and education to qualify for admission to graduate courses in this area. Students must show evidence of the ability to undertake a graduate program and give promise of proficiency in the fields.

The satisfactory completion of a minimum of 30 credit hours of graduate work approved by the adviser shall be required. These shall include at least 6 hours, exclusive of research, to be taken in courses open to graduates only. No more than 6 research credits may be applied to the minimum credit requirements. The required curriculum shall include:

Home Economics Courses	10-15 hr.
Courses in Allied Fields	10-15 hr.
Cognate Courses	6-10 hr.

An acceptable written thesis based upon individual research and the approval of an examining committee following an oral examination on the thesis shall be required before the candidate is recommended for the degree.

The Degree of Master of Science in Home Economics With a Major in Human Nutrition

The students who seek the degree of Master of Science in Home Economics with a major in Human Nutrition must have received the baccalaureate degree from an

approved institution. They should have sufficient background in nutrition, chemistry, biochemistry and physiology to qualify for admission to graduate courses in these areas. They must give evidence of ability to undertake a graduate program and give promise of proficiency in the field.

The satisfactory completion of a minimum of 30 credit hours of graduate work approved by the adviser is required. At least 6 credit hours shall be in courses open to graduate students only. No more than 6 hours credit in research may be applied to the minimum credit requirement. The required curriculum will include the following courses:

Home Economics	10-15 hr. (major field)
Allied Sciences	10-15 hr. (minor field)
Electives in supporting fields	6-10 hr.

A written comprehensive examination planned by the examining committee of at least three faculty members representing the major and minor areas of concentration; the presentation of an acceptable written thesis based upon individual research; and the approval by the examining committee following an oral examination on the thesis will be required before the degree is granted.

FOOD AND NUTRITION

FN

201. Diet Therapy. II. 3 hr. PR: FN 241, Zool. 271 or consent. Adaptations of normal diet for diseases whose prevention or treatment is largely influenced by diet. Offered in alternate odd years.

205. Experimental Cookery. II. 3 hr. PR: FN 15, Chem. 131, (1-hr. lec., two 2-hr. labs.). Utensils, ingredients, temperature, manipulation, and cooking methods as they affect quality of cooked products. Offered in alternate odd years.

211. Readings in Nutrition. II. S. 1-4 hr. PR: FN 241 or consent. Review of current literature and of present research. Topics depend upon needs and interests of class members.

221. Community Nutrition Problems. I. 2 hr. PR: Consent. (2-hr. lec., field work). Includes consideration of organizations and agencies through which these problems may be solved.

241. Human Nutrition. I. 3 hr. PR: One course in Nutrition, Physiology, or Biochem. or consent. (2 lec., 1 lab.). The role of food nutrients in the physiological and biochemical processes of the body; nutritional needs of healthy individuals under ordinary conditions and in periods of physiologic stress. Offered in alternate even years.

281. Problems in Nutrition and/or Diet Therapy. 1-4 hr. PR: Consent.

285. Problems in Foods. 1-4 hr. PR: Consent.

288. Problems in Institution Management. 1-4 hr. PR: Consent.

301. Graduate Nutrition Seminar. 1-4 hr. PR: FN 241 and consent. Review and discussion of recent progress in foods and nutrition research.

361. Nutrition Research. 1-6 hr. PR: FN 241, Chem. 5 or 106 or consent. Research in foods and/or nutrition.

TEXTILES AND CLOTHING

TC

212. Advanced Clothing Construction. II. 2 hr. PR: TC 232 or consent. Offers opportunity for creative expression and for understanding of pattern design through handling of fabrics on dress form. Costumes are designed, draped, and constructed.

217. Textiles for Consumers. I. 3 hr. PR: TC 17. Regulations, marketing channels, information sources, and new developments relevant to the selection of fabrics for household uses and wearing apparel.

222. Tailoring. II. 3 hr. PR: TC 2, 17. Tailoring of suits and coats. Emphasis placed on professional techniques, advanced fitting, and construction of garments. Second garment constructed by fast method techniques.

232. Costume Design. I. 2 hr. PR: TC 2, 217. Techniques of figure and fashion drawing. Designing for individuals of various types and ages. Some history of costume included.

282. Problems in Clothing. 1-4 hr. PR: Consent.

287. Problems in Textiles. 1-4 hr. PR: Consent.

HOUSING AND DESIGN

HD

223. Advanced Interior Design. 3 hr. PR: HD 23, 123, or consent. A study of the technical and design information necessary to comprehend and function within the contemporary home furnishings market. Offered alternate years.

283. Problems in Housing and/or Design. 1-4 hr. PR: Consent.

CHILD DEVELOPMENT AND FAMILY RELATIONS

CDFR

224. Family and the Individual in the Community. I. 3 hr. PR: One course in the family, or sociology, or consent. Social psychological analysis of the individual in the family and in other social systems. Involves the study of role relationships, community processes, and attitudes and values as they affect the behavior of the individual.

264. Family Development. I, II. 3 hr. PR: CDFR 114 or consent. A professional course designed to prepare students for work with families in their varying stages of development and different socio-economic levels. Involves intensive study of family relationships as affected by differing stages of the family life cycle, from the beginning family through the aging couple. Lecture, discussion, and observation of families.

266. Needs of Adolescents. I, II. 3 hr. A study of adolescent needs as met by the home with contributions of other agencies such as church, school and youth groups. Physical, social, and integrative needs will be considered from the standpoint of needs of all family members as well as the individual.

276. Seminar in Child Development. II. 2 hr. PR: Senior standing and consent. A review and discussion of recent literature pertaining to child development.

284. Problems in Family Relations. 1-4 hr. PR: Consent.

286. Problems in Child Development. 1-4 hr. PR: Consent.

376. Thesis in Child Development. 6 hr. PR: HEEd. 309 and consent. Thesis for the degree of Master of Science in Home Economics.

HOME MANAGEMENT AND FAMILY ECONOMICS

HMFE

210. Family Economics. I, II. 3 hr. PR: Senior or graduate standing. Management of the family's money resources. Consideration of the economic problems of families, of planned spending and saving, and of the role of the consumer.

230. Home Management, Principles and Application. I, II. PR: Upper-division standing. Study and application of management in a variety of situations faced by the family with opportunity to integrate knowledge from other courses.

250. Household Equipment. I, II. 2 hr. Selection, arrangement, use and care of equipment for various situations and for different income levels. Laboratory and discussion.

280. Problems in Home Management and/or Family Economics. 1-4 hr. PR: Consent.

HOME ECONOMICS EDUCATION

HEEd.

209. Evaluation in Home Economics. II. 3 hr. PR: 30 hr. of Home Economics, 7 hr. of Education. Experience in selecting, devising, and using evaluation devices for appraising progress toward desired goals in Home Economics Education. Offered alternate odd years.

219. Adult Education in Homemaking. I. 3 hr. PR: 30 hr. of Home Economics, and 7 hr. of Education. Current trends and present activities. Organization of adult classes; development of unit outlines; consideration of teaching methods; illustrative material and bibliography. Offered in alternate even years.

279. Seminar in Home Economics Education. II, S. 3 hr. PR: Senior standing and 6 hr. of Education. A review and discussion of recent literature pertaining to home economics at the junior and senior high school levels and the college and adult levels based on the history of the home economics movement from the Lake Placid Conference in 1909 to the present time.

309. Research Methods. 2 hr. Adaptations of research techniques to problems in home economics. For students writing problems, thesis, or research report.

319. Home Economics Curriculum. 3 hr. PR: Experience in teaching home economics and consent. Selection and organization of learning experiences in home economics. Practices and techniques currently used for curriculum planning and construction.

329. Supervision in Home Economics. 2 hr. PR: Teaching experience and consent. Designed for home economics teachers preparing to serve as supervising teachers in "off-campus" training centers. Function of supervision and organization of supervised teaching program. Techniques for helping students in training for teaching home economics.

360. Problem Report for the Degree of Master of Home Economics. 1-3 hr. PR: HEEd. 309.

389. Problems in Home Economics Education. 1-4 hr. PR: Consent.

ARTS AND SCIENCES

BIOLOGY

The Department of Biology offers work leading to the degrees of Master of Arts in Biology, Master of Science, and Doctor of Philosophy in either Botany or Zoology. In addition to the requirements of the Graduate School, the department has certain rules and regulations for graduate students. Current revisions of departmental requirements may be acquired by writing the Chairman, Department of Biology, preferably before seeking admission to the Graduate School. Students may enroll in graduate courses, but may work toward an advanced degree only with the approval of the department. It is not possible to predict accurately either the amount of time, or the number of courses required for an advanced degree except on an individual basis.

BIOLOGY

203. Natural History. S. 3 hr. PR: General biology or equiv. Lectures, demonstrations, and field trips designed to provide a brief survey of certain aspects of general biology suitable for elementary and high schools.

204. Biology Workshop. S. 3 hr. PR: Biol. 2 or equiv. Lectures and demonstrations designed to aid the teacher of pre-college biology, and constituting a general review.

205. Principles of Evolution. I, S. 3 hr. PR: Biol. 2, Bot. 2, or Zool. 2. An introduction to the study of evolution.

206. Modern Concepts in Biology. S. 2-3 hr. PR: Biol. 2 or equiv. A course designed to acquaint the advanced student or teacher with the latest methods and knowledge in the field of biology. The effect of new information in confirming or changing older concepts will be fully explored, with student participation emphasizing different areas.

207. History of Biology. I. 3 hr. PR: Biol. 2. History of the development of biological knowledge, with philosophical and social backgrounds.

208. Great Texts of Biology. II. 1 hr. PR: Biol. 2 or equiv. A study of some of the great classics in biology, such as Theophrastus' *Enquiry into Plants,* Vesalius' *Epitome,* Harvey's *Motion of the Heart and Blood,* Darwin's *Origin of Species, and* Mendel's *Experiments on Hybrid Plants.*

209. The Literature of Biology. I. 1 hr. PR: Biol. 2 or equiv. A consideration of the courses and forms of the literature, the development of bibliographies, and the preparation of scientific papers.

210. Biological Science for High School Teachers. II. 2 hr. PR: Biol. 206 or equiv. A study of demonstrations and laboratory equipment suitable for high schools, and a review of recent developments in the biological sciences.

211. Microtechnique. I. 3 hr. PR: Biol. 2, Bot. 2 or Zool. 2 or equiv. Theory and practice of making microscopic preparations, etc.

212. Biological Preparations. S. 3 hr. PR: Biol. 1. Methods for the preparation of microscopic slides and other demonstration materials for high school biology classes. Emphasis will be on procedures using equipment and reagents commonly available to the teacher.

215. Cytology. II. 4 hr. PR: Biol. 2. Cells, their structure and functions.

221. General Ecology. I. 4 hr. PR: Biol. 1-2 or equiv., and 4 hr. upper division. The interactions among and the intra-actions within biotic communities are emphasized as the inter-relationships of animals with one another and with their environment are studied to illustrate basic ecological concepts and unifying principles.

296, 297. Special Topics. I, II. 1-4 hr. per sem. PR: Consent. Critical studies of topics to be assigned by the instructor.

311. Advanced Microtechnique. II. 1-3 hr. PR: Biol. 211 and consent.

321, 322. Seminar in Ecology. I, II. 2 hr. per sem. PR: Bot. 221 or Zool. 221 and consent. Selected topics on relations of organisms to environment and on communities of organisms.

376, 377. Seminar in Physiology. I, II. 2 hr. per sem. PR: Biol. 274, Bot. 273, Zool. 271, or Pl. Path. 330, and consent. Selected topics on functions common to all organisms.

BOTANY

201, 202. Seminar. I, II. 1 hr. Topics of general interest to botanists are considered.

204. The Plant Kingdom. I, II, S. 4 hr. PR: Biol. 2 or equiv. A survey of the plant kingdom (not open to students with credit in Bot. 2 or Bot. 231 and 232).

218. Economic Botany. II. 3 hr. PR: Biol. 2 or Bot. 2. Plants from the standpoint of their value to man.

221. Plant Ecology. I. 4 hr. PR: Biol. 2 or Bot. 2. Environmental relationships of plants.

224. Plant Communities. S. 3 hr. PR: Biol. 2 or equiv. Field studies in ecology.

227. Geographic Botany. I, S. 2 or 3 hr. PR: Bot. 2 or Biol. 2. Study of plant groupings and worldwide distribution of plants.

231. Plant Morphology. I. 4 hr. PR: Biol. 2 or Bot. 2. Development and structure of algae and fungi.

232. Plant Morphology. II. 4 hr. PR: Biol. 2 or Bot. 2. Development and structure of bryophytes and vascular plants.

235. Plant Anatomy. I. 4 hr. PR: Bot. 2 or equiv. Anatomy of seed plants.

250. Fresh Water Algae. I. 4 hr. PR: Bot. 1, 2 or Biol 1, 2. Taxonomy, cytology, and ecology of aquatic, aerial, and land forms of fresh-water algae.

255. Bryophytes. II. 2 hr. PR: Bot. 2 or Biol. 2. Identification of liverworts and mosses.

256. Vascular Cryptogams. II. 4 hr. PR: Bot. 1, 2 or Biol. 1, 2. Taxonomy, anatomy, cytology, and ecology of the club-mosses, horsetails, and ferns.

261. Advanced Systematic Botany. I. 3 hr. PR: Bot. 161 or equiv. Taxonomy of pteridophytes, gymnosperms, and monocotyledons.

262. Advanced Systematic Botany. II. 3 hr. PR: Bot. 161 or equiv. Taxonomy of dicotyledons.

263. Taxonomy of Vascular Plants. S. 3 hr. PR: Biol. 2 or equiv. Field studies in the taxonomy of higher plants.

265. Aquatic Seed Plants. I. 3 hr. PR: Biol. 2 or equiv. Classification, ecology, and economic importance of aquatic seed plants.

266. Flora of West Virginia. II, S. 3 hr. PR: Biol. 2 or equiv. A consideration of the native plant life of the State.

296, 297. Special Topics. I, II. 1-4 hr. per sem. PR: Consent. Critical studies of topics to be assigned by the instructor.

316. Cytotaxonomy. II. 3 hr. PR: Biol. 2, Bot. 161, Genet. 221, or consent. The determination of phylogenetic relationships of cytological and taxonomic methods.

325. Experimental Ecology. II. 2-4 hr. PR: Biol. 1, Bot. 161, and Bot. 221 or equiv. Physico-chemical processes of plants.

331. Plant Embryology. II. 2 hr. PR: Biol. 2 or Bot. 2 and consent. Gametogenesis, syngamy, and embryo development in vascular plants.

351, 352. Problems in Plant Taxonomy. I, II. 1-6 hr. PR: Bot. 261, 262, or equiv.

368. Agrostology. I. 2 hr. PR: Bot. 161 or equiv. Taxonomy of grasses.

374. Advanced Plant Physiology. II. 2-3 hr. PR: Bot. 171 or equiv.; also courses in general physics and organic chemistry. Advanced studies of plant processes and physiological methods.

391, 392, 393, 394. Research. I, II. 1-15 hr.

210. Animal Behavior. I. 3 hr. PR: Zool. 2 or equiv. Principles of individual and group behavior.

222. Field Studies of Invertebrates. S. 3 hr. PR: Biol. 2 or equiv. Taxonomy and ecology of the invertebrates.

223. Field Studies of Vertebrates. S. 3 hr. PR: Zool. 2 or equiv. Taxonomy and ecology of the vertebrates.

224. Limnology. I. 5 hr. PR: Zool. 2 or equiv. Physical, chemical, and biological investigations of lakes and inland waters.

231. Comparative Anatomy. I. 5 hr. PR: Zool. 2 or equiv. Organs and systems of various vertebrates, together with other facts of interest concerning these animals.

232. Vertebrate Embryology. II. 5 hr. PR: Zool. 2 or equiv. Introductory study of development of vertebrates, based on frogs, fowls, and mammals.

233. Comparative Histology. II. 3 hr. PR: Zool. 231. A comparative study of the tissues of the vertebrates.

235. Comparative Developmental Anatomy. II. 3 hr. PR: Zool. 231. Anatomy and development of the organs and systems of various vertebrates.

236. Comparative Neuroanatomy. II. 4 hr. PR: Zool. 2, 231, and consent. Comparative study of development and anatomy of the nervous systems of the vertebrates.

237. Osteology. I. 2 hr. PR: Zool. 2 or equiv. Development and anatomy of the skeleton.

250. Principles of Animal Systematics. I. 2 hr. PR: Zool. 2 or Biol. 2. The species concept and its interpretation. Taxonomic characters of invertebrates and vertebrates.

251. Invertebrate Zoology. I. 4 hr. PR: Zool. 2 or equiv. Advanced study of animals without backbones.

263. Ichthyology. I. 3 hr. PR: Zool. 2 or equiv. Ecology, life histories, taxonomy, and distribution of fishes.

264. Fisheries Biology. II. 4 hr. PR: Zool. 2 or equiv. Principles and techniques of fisheries management with an introduction to the theory of population.

265. Ornithology. II. 3 hr. PR: Zool. 1 or equiv.; consent. Field and laboratory studies on identification, migration, protection, nesting, and food habits of birds.

271. Human Physiology. I, II, S. 4 hr. An introductory course in the functions of man.

272. Physiology of the Endocrines. II. 4 hr. PR: General zoology or general biology, comparative anatomy, and organic chemistry. Comparative physiology and endocrine mechanisms. The relation of hormonal and parahormonal agents to chemical coordination, metabolism, growth, development, and sex.

273, 274. Cellular Physiology. I, II. 4 hr. per sem. PR: Biol. 2 or Zool. 2; Chem. 238 and Physics 2. A consideration of the functions common to all forms of living matter.

275. Vertebrate Physiology. I. 4 hr. PR: Zool. 2 or equiv. The functions of vertebrate organs and organ systems.

276. Comparative Physiology. I. 4 hr. PR: Zool. 273 or equiv. A study of the diverse ways in which different kinds of animals meet their functional requirements.

331. Mammalian Anatomy. S. 3 hr. PR: Zool. 231, 232, 233, 235, 236 and 237 and consent. The study of the anatomy of selected animals from the regional and sectional approach.

332. Anatomy of the Integument. I. 2 hr. PR: Zool. 231, 232, 233, 234, and 235 and consent. An advanced study of the gross, developmental, comparative, microscopic anatomy of the integument and its derivatives.

334. Anatomy of the Circulatory and Respiratory Systems. II. 3 hr. PR: Zool. 231, 232, 235, and consent. An advanced study of the gross, developmental, and comparative anatomy of the circulatory and respiratory systems.

335. Anatomy of the Urogenital System. I. 3 hr. PR: Zool. 231, 232, and 235 and consent. An advanced study of the gross, developmental and comparative anatomy of the genital and urinary systems.

336. Advanced Comparative Neuroanatomy. II. 3 hr. PR: Zool. 231, 232, 233, 236 and consent. An advanced study of the gross, developmental, and comparative anatomy of the nervous system.

337. Advanced Osteology. S. 3 hr. PR: Zool. 231 and 237 and consent. The study of the gross, microscopic, developmental, and comparative anatomy of the skeleton.

338. Analogies and Homologies. I. 3 hr. PR: Zool. 231, 232, 233, 235, 236, 237, 331, 334, 336, and 337, and consent. A detailed study of the analogies and homologies as found in the vertebrates.

339. Anomalies and Variations. II. 3 hr. PR: Zool. 231, 232, 233, 235, 236, 237, 331, 334, 335, 336, 337, and 338 and consent. A detailed study of the types, causes, results, and frequency of vertebrate anatomical and developmental anomalies and variations.

351. Advanced Invertebrate Zoology. I, II. 1-4 hr. PR: Zool. 251 and consent.

391, 392, 393, 394. Research. I, II. 1-15 hr.

396, 397. Special Topics. I, II. 1-3 hr. per semester. Critical studies of topics to be determined according to the student's requirements.

CHEMISTRY[1]

Departmental Requirements

Candidates for graduate degrees in chemistry must have had prior fundamental training in inorganic, analytical, organic, and physical chemistry as ordinarily required for the B.S. degree in chemistry and must have completed differential and integral calculus. Beginning graduate students desiring to become candidates for a graduate degree in chemistry must take placement examinations in the above listed four fields of chemistry prior to their first registration as a graduate student. These examinations are offered during the week preceding registration for each regular semester. At the discretion of the faculty these examinations may be waived by a prior, outstanding performance on the Graduate Record Examination.

Deficiencies revealed by an unsatisfactory performance on any of the placement examinations require enrollment, or audit, in the appropriate undergraduate courses. Satisfactory completion of such remedial work is required before the student may be considered for a graduate degree.

Chemistry 210 or the equivalent, Chemistry 201 or 301, depending upon previous training, Chemistry 343, Chemistry 367 or 286 and 289, depending upon previous training, Chemistry 391 and 392, and a maximum of 6 hours of research leading to a thesis are required for the Master of Science degree. In addition, the student must elect approved 200 or 300 courses within the department, or in related fields, to complete a total of 30 hours. No more than 10 hours may be elected outside the Department of Chemistry.

[1]For information as to courses in chemistry available in the Kanawha Valley Graduate Center of West Virginia University, write to: Director, Kanawha Valley Graduate Center of West Virginia University, Institute, W. Va.

Applicants for the degree of Doctor of Philosophy who have not obtained a Master's degree in Chemistry from this department will be required to satisfy the placement examination requirements for the Master's degree. Written evaluation examinations in the four major areas of chemistry are required of all students desiring to study for the Ph.D. degree. These examinations must be satisfactorily completed and the Ph.D. language requirements satisfied at least two years before the expected completion of the research for the Ph.D. degree. If a student shall have accumulated a sufficiently high grade-point average on all work in the Graduate School, which must include at least 20 hours deemed by the faculty to be of full graduate stature, and provided the student shall have satisfied the Ph.D. language requirements, he may be excused from the evaluation examinations by faculty action.

A written comprehensive examination in that area of chemistry (inorganic, analytical, organic, or physical) in which the student's research lies, as well as in special topics from any areas particularly related to his research, is required at least one year before the expected date of completion of the Ph.D. research.

Within one month after successful completion of the written comprehensive examination, the student shall present a proposition for a research problem not intimately related to his own problem, or to any particular research problem being actively pursued at West Virginia University. He shall be required to present a proper oral defense of his proposition before the members of his research committee and other members of the staff who may be interested.

Course requirements for the Ph.D. degree are 60 hours, exclusive of the research problem leading to the dissertation. The required courses, in addition to those required of the M.S. degree, are Chemistry 302, 367, 368, 369, Journal Meeting and Seminar. Candidates for degrees with an organic option must establish credit in Chemistry 344, 347, and 348. Candidates for degrees in options other than organic must establish credit in Chemistry 311, 370, and 371. Electives may be chosen to complete the total, no more than 15 hours of which, with the adviser's approval, may be taken outside the department. Course work earned for the M.S. degree including a maximum of 6 hours of M.S. research will count toward the total requirement of 60 hours.

A final oral examination based primarily on the research problem is required of both M.S. and Ph.D. degree candidates after completion of the thesis or dissertation.

201. Intermediate Inorganic Chemistry. I. 3 hr. PR: Chem. 261 or concurrent enrollment. Required of chemistry majors.

202. Inorganic Syntheses. I. 2 hr. PR: Chem. 4 or Chem. 1, 2, and 115.

209. Intermediate Analytical Chemistry. II. 3 hr. PR: Chem. 261 or concurrent enrollment. Required of chemistry majors.

210. Instrumental Analysis. I. 3 hr. PR: Chem. 260 or consent.

214. Qualitative Organic Analysis. I. 3 hr. PR: Chem. 238. Required of chemistry majors. Recommended course following Chem. 238.

217. Polymer Chemistry. II. 2 hr. PR: Chem. 238, 261.

219. Inorganic Chemistry. I. 2 hr. PR: Chem. 1 and 2. Introduction to modern inorganic chemistry. Enrollment limited to members of Academic Year Institute.

233. Organic Chemistry. I, II. 4 hr. PR: Chem. 4 or 115. Required of students who major in chemistry, pharmacy, premedicine, predentistry, and chemical engineering. 3 lect., 1 lab.

238. Organic Chemistry. II. 4 hr. PR: Chem. 233. Continuation of Chem. 233. 3 lect., 1 lab

239. Organic Synthesis. I and II. 2 hr. PR: Chem. 238.

243, 244. Selected Topics. I, II. 1-3 hr. PR: Consent. Individual investigations under supervision of instructor.

245, 246. Honors Course. I, II. 1-3 hr. PR: Consent. Research for students in the honors program.

247. Stereochemistry. I. 2 hr. PR: Chem. 238. Open to seniors.

258. Physical Chemistry Laboratory. I. 1-2 hr. PR: Chem. 260 or concurrent enrollment. Required of majors in chemistry.

259. Physical Chemistry Laboratory. II. 1-2 hr. PR: Chem. 258, 260, and 261 or concurrent enrollment. Required of all majors in chemistry.

260. Physical Chemistry. I. 3 hr. PR: Chem. 233, Physics 112, Math. 117. Required of students who major in chemistry or chemical engineering.

261. Physical Chemistry. II. 3 hr. PR: Chem. 260. A continuation of Chem. 260.

262. Colloid and Surface Chemistry. II. 2 hr. PR: Physical chemistry.

264. Physical Chemistry. I. 4 hr. PR: 11 hr. of college chemistry. For non-chemistry graduate students. Enrollment limited to members of Academic Year Institute. 3 lect., 1 lab.

270. Practical Infrared Spectroscopy. II. 3 hr. PR: Chem. 238 or concurrent enrollment. A practical course for students in chemistry and related fields who may use infrared spectroscopy as a tool in research and applied science.

273. Chemical Literature. I. 2 hr. PR: Chem. 238 or concurrent enrollment. Study of procedures used for search of scientific literature.

277. Chemistry of Natural Products. II. 2 hr. PR: Chem. 238 or consent. The chemistry of representative members of the principal groups of terpenoids. Offered in alternate years.

280. Electrochemistry. II. 3 hr. PR: Chem. 238, 261. 1 lect., 2 labs.

282. Chemistry of Natural Products. II. 2 hr. PR: Chem. 238 or consent. The chemistry of representative members of the principal groups of alkaloids. Offered in alternate years.

285. Nuclear Chemistry. II. 3 hr. PR: Chem. 4 or equiv. Math. 116. Fundamentals of radioactivity as applied to chemistry and discussion of tracer applications.

286. Introductory Molecular Structure. II. 3 hr. PR: Chem. 260. An introduction to the quantum theory of chemical bonding and discussion of experimental methods for determining molecular structure and bond properties.

289. Chemical Thermodynamics. I. 3 hr. PR: Chem. 261, Math. 117.

301. Advanced Inorganic Chemistry. I. 3 hr. PR: Chem. 261. Required of all graduate chemistry majors.

302. Advanced Inorganic Chemistry. II. 3 hr. PR: Chem. 301.

311. Research Techniques. I. 2 hr. PR: Chem. 261. Introduction to common research techniques.

343. Advanced Organic Chemistry. I. 3 hr. PR: Chem. 238 or equiv. Required of all graduate chemistry majors.

344. Advanced Organic Chemistry. II. 3 hr. PR: Chem. 343.

347. Physical Organic Chemistry. I. 2 hr. PR: Chem. 344.

348. Advanced Organic Chemistry. II. 2 hr. PR: Chem. 347 or consent. Discussion of recent topics in organic chemistry.

350. Heterocyclic Chemistry. II. 2 hr. PR: Chem. 343.

367. Advanced Physical Chemistry. I. 3 hr. PR: Chem. 286 and 289.

368. Advanced Physical Chemistry. II. 2 hr. PR: Chem. 289.

369. Chemical Kinetics. II. 2 hr. PR: Chem. 261 and 286.

370. Quantum Chemistry. I. 3 hr. PR: Chem. 286 or consent. Discussions of the development and significance of quantum mechanics with application to chemical problems.

371. Theoretical Chemistry. II. 3 hr. PR: Chem. 368 and 370.

391, 392. Journal Meeting and Seminar. I, II. 1 hr. per sem. Required of students working for graduate degrees with a major in chemistry. Recommended as a minor for students from other departments.

395, 396. Special Topics. I, II. 1-3 hr. per sem. Chemistry of carbohydrates, chemical microscopy, crystallography, coordination compounds, unfamiliar oxidation states, organic and inorganic preparations, inorganic polymers, infrared, microwave, and radio-frequency spectroscopy are suggested topics.

397, 398, 399. Research. I, II. 1-15 hr. Six hours are required for the Master's degree. Students may enroll more than once for each course.

ECONOMICS

A candidate for the Master of Arts degree with a major in Economics must have satisfactorily completed a minimum of 18 semester hours of upper-division courses in Economics or closely allied subjects at an accredited university or college. He must have satisfactorily completed a course in statistics and have a minimum grade-point average of 2.5 (C+) as an undergraduate. Additional courses, prerequisite for work the student expects to pursue, may be required. Deficiencies in undergraduate preparation must be removed without credit.

A program of courses will be planned by the candidate with his faculty adviser and subject to the approval of the adviser. The M.A. degree requires 30 semester hours of graduate credit, including an acceptable thesis. A minimum of 6 semester hours must be completed in a minor field in liberal arts other than Economics, and of the remainder no fewer than 15 hours must be taken in Economics or approved courses in the College of Commerce. A grade-point average of at least 3.0 (B) is required on all work taken while a graduate student.

Candidates for the M.A. degree with a major in Economics should take the following courses if they have not already completed them:

Economics 211—Micro Economic Analysis
Economics 212—Macro Economic Analysis
Economics 220—Introduction to Quantitative Analysis
Economics 222—History of Economic Thought
Economics 241—Public Finance
Economics 302—Research and Reports
Economics 319—Seminar in Economics

A listing of graduate courses in Economics will be found under the College of Commerce section on page 110.

ENGLISH LANGUAGE AND LITERATURE

To be admitted to the Department of English as a prospective candidate for the degree of Master of Arts, a student is expected to have completed work comparable to the Department's undergraduate requirements for English majors and to present a record distinctly above the average. A student whose undergraduate work fails to meet these standards in quantity or in distribution of courses may be admitted conditionally and proceed to make up undergraduate deficiencies by completing extra work in undergraduate or graduate courses as prescribed by the Department.

Course Requirements: A candidate for the M.A. degree will be expected to complete courses covering the major periods and the works of the major authors of English literature. The minimum requirement is 36 hours of graduate course work. The requirements and the student's program are governed in part by his showing on the comprehensive examination.

If a student chooses to complete work in a related field for a graduate minor, he is expected to complete 8 hours in the minor field.

Thesis: A thesis or Master's essay may be required as a part of the graduate program of any candidate at the discretion of the department. The writing of a thesis is considered to be particularly important to those candidates who anticipate proceeding with more advanced graduate studies. A student who chooses the thesis option or who is advised to write a thesis will be allowed at least 6 hours of course credit toward his requirements for the degree. He will be assigned to an adviser and thesis director when the field in which the thesis is to be written has been determined. The specific subject should be chosen during the first semester or not later than the second summer session of his enrollment as a graduate student.

Foreign Language Requirement: A candidate for the degree of Master of Arts in English must have completed studies in a foreign language (preferably French or German) equivalent to 12 semester hours of college work. If an applicant does not meet this requirement, he may prepare to meet it through independent study, or otherwise, in order to show a reading knowledge on examination.

222. Modern American Biography. I. 3 hr. A selection of the most significant and interesting biographies and autobiographies of Americans of distinction in literature, the arts, and public life.

223. Modern British Biography. II. 3 hr. Representative works by such eminent masters of biography as Lytton Strachey, Sir Osbert Sitwell, Lord David Cecil, Sean O'Casey, Hugh Kingsmill, and others.

*224. Literary Criticism. II. 3 hr. The history of literary criticism from Artistotle to modern times.

225. Recent Literary Criticism. I, II. 3 hr. A brief survey of the theories and essays of four major schools of modern criticism and an application of these theories to a novel, a play, and to selected poems and short stories.

228. Advanced Grammar. I, II. 3 hr. A course in descriptive grammar, the parts of speech, construction, and methods of diagramming.

230. History of the English Language. I. 3 hr. A study of the nature of the language; questions of origins, language families, development, relationships of English as one of the Indo-European languages.

231. Old English. I. 3 hr. A study of Anglo-Saxon grammar, with selected readings from the literature of the period.

232. Beowulf. II. 3 hr. PR: English 231. Continuation of the study of Old English; critical reading of *Beowulf*.

234. Chaucer. I. 3 hr. A study of Chaucer's *Canterbury Tales* and *Troilus and Criseyde*. In addition to an understanding and appreciation of Chaucer's literary work, the student is expected to acquire an adequate knowledge of Chaucer's language.

235. Shakespeare. 3 hr. An intensive study of a limited number of Shakespeare's major plays; close reading of the text, with attention to textual history and the history of scholarship, interpretation, and criticism dealing with each play.

239. Southern Writers. II. 3 hr. Examination of twentieth-century southern essayists, poets, short-story writers, and novelists in relation to the ideological background.

242. Literature for Teachers. S. 3 hr. Study and appreciation of selected works of American authors, with special reference to the high-school curriculum. Given usually in the Summer Session.

243. Literature for Teachers. S. 3 hr. Study and appreciation of selected works of English authors. Recommended for teachers of high-school English. Given usually in the Summer Session.

*Given only in alternate years.

244. Literature of the Sixteenth Century. I. 3 hr. The literature of the Renaissance in England, with emphasis on the major authors and non-dramatic genres and on the relations of English literature to Continental literature.

245. Literature of the Seventeenth Century. II. 3 hr. The major authors and principal themes of English literature during the period, with due attention to the political and social background of the time, especially the struggle between Cavalier and Puritan.

247. Literature of the Eighteenth Century. I. 3 hr. Literature of the period 1700-1750, studied in relation to the social, political, and religious movements of the time.

248. Literature of the Eighteenth Century. II. 3 hr. Continuation of English 247, covering the latter half of the century. May be taken independently of English 247.

249. The Romantic Movement. I. 3 hr. The works of Wordsworth, Coleridge, and Keats, together with an introduction to works of scholarship in the field of English Romanticism.

250. American Romanticism. II. 3 hr. The writings of Ralph Waldo Emerson, Henry David Thoreau, and Nathaniel Hawthorne. A study of the relations of these men to the history of their own time, and of their contributions to American thought and art.

252. English Literature, 1880-1914. II. 3 hr. A study of the more important writers and literary movements of the late Victorian and the Edwardian periods with emphasis on Hardy, Housman, Hopkins, Henley, Pater, Gissing, Moore, Butler, and the writers of the "aesthetic movement."

*253. Pre-Shakespearean Drama. I. 3 hr. A study of the medieval drama from its beginning to the middle of the sixteenth century.

*254. Elizabethan Drama. II. 3 hr. A study of the dramatists of the Elizabethan period, exclusive of Shakespeare.

*255. Restoration and Eighteenth Century Drama. I. 3 hr. A study of persistent forms and new developments in the drama of the period.

256. Modern Drama. II. 3 hr. A study of world drama from Ibsen to the present day.

257. Victorian Poetry. I. 3 hr. A study of the major Victorian poets—Tennyson, Browning, Arnold, Rossetti, Morris, Swinburne, Fitzgerald, and a few of the later Victorian poets.

*258. Victorian Prose. II. 3 hr. A study of the non-fictional writings of the great Victorian prose critics: Carlyle, Ruskin, Arnold, Newman, Macaulay, Huxley, Morris.

259. Dramatic Art of Shakespeare. II. 3 hr. A study of several of Shakespeare's histories, comedies, and tragedies, showing the chronological development of his art and matters of stage presentation in Shakespeare's age.

260. Studies in Shakespearean Comedy. I, II. 3 hr. PR: English 142, or consent. Textual and dramatic study of representative comedies.

262. Study of Selected Authors. (American). I, II. 3 hr. A study of the works of a principal American author, or of more than one, as announced when the course is scheduled.

263. Study of Selected Authors. (English). I, II. 3 hr. Study of the works of one or more of the principal English authors, as announced in the schedule when the course is listed.

264. Spenser. I. 3 hr. A study of Spenser's poetry, minor poems, and *The Faerie Queene*, forms and sources, purpose of the great epic, social, political, and religious allegory.

265. Byron and Shelley. II. 3 hr. Reading and study of the works of two poets of the later Romantic Movement, together with works of criticism and scholarship related to the period.

267. Milton. II. 3 hr. A study of all of Milton's poems and of a few selected prose works.

270. American Poetry. I. 3 hr. A study of the major American poets of the nineteenth and twentieth centuries—Bryant, Poe, Emerson, Longfellow, Whitman, Dickinson, Frost, Eliot. Primary emphasis on their poetry as poetry; background materials minimized.

272. Folk Literature. II. 3 hr. A study of the folk ballad, its origin, history, and literary significance, based on Child's collection and on American ballad collections.

*275. The English Novel to the Time of Scott. I. 3 hr. A study of the English novel from the 16th century to the time of Scott, showing the development of the novelistic art from early narrative beginnings.

*276. The English Novel, 1832-1900. II. 3 hr. A continuation of English 275. The development of the English novel from the early nineteenth century to the beginning of the twentieth century.

*278. Tragedy. II. 3 hr. Masterpieces of tragedy from Greek times to modern, with consideration of the changing concepts of tragedy and of the ethical and ideological values reflected in the works of major tragic authors.

280. The Modern Novel. I, II. 3 hr. The twentieth-century novel, with emphasis upon the works of selected British novelists.

291. Introduction to Literary Research. I, II. 2 or 3 hr. Lectures and exercises in research problems to prepare the student for such work in graduate and professional schools.

300. Thesis. I, II. 3 hr.

301. Thesis. I, II. 3 hr.

331, 332. The Renaissance. I, II. 3 hr. per sem. PR: Graduate standing. Literary and cultural influences from the Continent on the English literature of the late fifteenth and early sixteenth centuries. Discussion and analysis of major English literary works of the period.

341, 342. English Drama to 1642. I, II. 3 hr. per sem. PR: Graduate standing. A consideration of the varied aspects of English drama from its medieval beginnings to the middle of the sixteenth century. Discussion and analysis of selected dramas.

371, 372. The Victorian Era. I, II. 3 hr. per sem. PR: Graduate standing. Writers of the Victorian period considered in relation to the cultural matrix from which they rise. Particular attention is given to the varying intellectual currents of the era.

392. Seminar. I, II. 2 or 3 hr. PR: Specific authors to be approved by the instructor. A graduate study of particular periods or authors.

393, 394. American Literature, 1870-. I, II. 3 hr. per sem. PR: Graduate standing. Literary and intellectual America from 1870 to 1914 in terms of leading literary men and changing cultural patterns of the period. Discussion and analysis of selected prose and poetic works.

FOREIGN LANGUAGES

The Department of Foreign Languages offers graduate study in French, Spanish, German, Latin, and Greek literature and culture, in linguistics, in language teaching methods, and in bibliography and research. The department also directs a master's program in Latin American Area Studies. Candidates for the master's degree are accepted in French, Spanish, German, and Latin, and in Latin American Area Studies.

A student who wishes to do graduate work in this department should apply to the chairman of the department, who will act as his adviser until the student becomes a candidate for a graduate degree. Usually, he will be expected to have an undergraduate major in a foreign language, preferably the one in which he proposes to major. He should normally show an average of at least 3.0 (B) in his undergraduate foreign language courses.

A candidate must complete at least 32 graduate hours for a master's degree, 18 to 24 hours of which will be in his major field. A prospective elementary or secondary school teacher must take 3 additional hours in Language Teaching Methods. Six hours of the major work may take the form of a master's thesis. The candidate's committee will make all decisions as to the distribution of courses and the thesis requirement in the light of the student's aims and needs.

FRENCH

203. Refresher Course in Conversational French. 3 hr. PR: A.B. in French or consent. Intensive spoken French designed primarily for teachers of French in the elementary school.

217. French Civilization. II. 3 hr. PR: 12 hr. of French.

221. The Romantic Movement. I. 3 hr. PR: French 115.

222. French Realism. II. 3 hr. PR: French 118.

226. Literary Criticism. II. 3 hr. PR: A.B. in French or consent.

227. Graduate Reading in French. No credit. A special course to prepare Ph.D. candidates for the reading examination in French.

229. Literature of the 16th Century. I. 3 hr. PR: A.B. in French or consent.

231. Phonetics and Pronunciation. II. 3 hr. PR: 18 hr. of French or equiv.

237. Moliere. II. 3 hr. PR: French 115.

241. French Structural Linguistics. 4 hr. PR: 12 hr. of French. A special course for the NDEA Language Institute.

242. Methods in French Secondary Teaching. 4 hr. PR: 12 hr. of French. A special course for the NDEA Language Institute.

244. Explication De Textes. II. 3 hr. PR: 18 hr. of French or equiv.

271. The Modern Novel to 1930. I. 3 hr. PR: A.B. in French or consent.

272. The Novel After 1930. II. 3 hr. PR: A.B. in French or consent.

292. Pro-Seminar in French Literature. 1-6 hr. Special topics.

301. Thesis. 3-6 hr.

392. Seminar in French Literature. 1-6 hr. Special topics.

SPANISH

211. Nineteenth Century Literature to 1870. I. 3 hr. PR: Spanish 3 and 4, or equiv.

212. Spanish Literature Since 1870. II. 3 hr. PR: Spanish 3 and 4, or equiv.

215. Lyric Poetry. I. 3 hr. PR: 12 hr. of Spanish, or equiv.

216. Spanish Civilization and Culture. I. 3 hr. PR: 12 hr. of Spanish, or equiv.

215. Lyric Poetry. I. 3 hr. PR: 12 hr. of Spanish, or equiv.

216. Spanish Civilization and Culture. I. 3 hr. PR: 12 hr. of Spanish, or equiv.

217. Spanish-American Literature and Culture. I. 3 hr. PR: Spanish 3 and 4, or equiv.

218. Spanish-American Literature and Culture. II. 3 hr. PR: Spanish 3 and 4, or equiv. Continuation of Spanish 217.

221. Literature of the Golden Age to 1635. I. 3 hr. PR: 18 hr. of Spanish, or equiv.

222. The Golden Age After Lope De Vega. II. 3 hr. PR: 18 hr. of Spanish, or equiv.

223. Estudios De Estillo. I. 3 hr. PR: 18 hr. of Spanish, or equiv.

224. Explication De Textos. II. 3 hr. PR: 18 hr. of Spanish, or equiv.

225. The Picaresque Novel. I. 3 hr. PR: 12 hr. of Spanish, or equiv.

227. Graduate Reading in Spanish. No credit. A special course to prepare Ph.D. candidates for the reading examination in Spanish.

241. Spanish Structural Linguistics. 4 hr. PR: 12 hr. of Spanish. A special course for the NDEA Language Institute.

242. Methods in Spanish Secondary Teaching. 4 hr. PR: 12 hr. of Spanish. A special course for the NDEA Language Institute.

291. Cervantes. II. 3 hr. PR: A.B. in Spanish or consent

292. Pro-Seminar in Spanish Literature. 1-6 hr. Special topics.

295. Sixteenth Century Literature. I. 3 hr.

297. Pro-Seminar in Spanish-American Studies. 1-6 hr. Special topics.

301. Thesis. 3-6 hr.

392. Seminar in Spanish Literature. 1-6 hr. Special topics.

397. Seminar in Spanish-American Studies. 1-6 hr. Special topics.

GERMAN

201. Independent Reading. I. 3 hr. Supervised reading for students who wish to do intensive work in any field of interest.

202. Independent Reading. II. 3 hr. Continuation of German 201.

227. Graduate Reading in German. No credit. A special course to prepare Ph.D. candidates for the reading examination in German.

242. Faust. II. 3 hr. Critical study of Goethe's *Faust*.

243. Medieval German Literature. I. 3 hr. PR: German 4 or consent.

244. German Literature of the Reformation and Renaissance. II. 3 hr. PR: German 4 or consent.

245. Classicism and Romanticism. I. 3 hr. PR: German 4 or consent. A critical study of German literature from 1750 to 1830.

246. The Liberal Age. II. 3 hr. PR: German 4 or consent. A critical study of German literature from 1830 to 1880, with an emphasis upon poetic realism.

247. The Age of Crisis. II. 3 hr. PR: German 4 or consent. A critical study of German literature from 1880 to the present.

265. German Civilization. I. 3 hr. PR: 12 hr. of German or consent. A general comprehensive survey of the most important aspects of German culture, including a brief historical background, the development of the German language, geography, science, music, art, architecture, literature, and philosophy.

275. The Modern Novel. I. 3 hr. PR: 18 hr. of German. Supervised reading of nineteenth century novels.

276. The Modern Novel. II. 3 hr. Continuation of German 275, with emphasis on recent fiction.

292. Pro-Seminar in German Literature. 1-6 hr. Special topics.

301. Thesis. 3-6 hr.

392. Seminar in German Literature. 1-6 hr. Special topics.

LATIN

201. The Story and Novel. I. 3 hr. PR: Latin 109, 110, or equiv. The origin of the story and novel is traced from Homer to the Medieval Greek and Latin romance writers. Selections from Petronius, the *Cena Trimalchionis*, and from Apuleius, *Cupid and Psyche.*

202. Drama. II. 3 hr. PR: Latin 109, 110, or equiv. A brief history of the origin and development of Greek and Roman drama. The *Menaechmi* of Plautus, the *Andria* of Terence, and the *Medea* of Seneca are read in Latin.

203. Oratory. II. 3 hr. PR: Latin 109, 110, or equiv. A survey of Greek and Roman oratory is given and part of the first book of Cicero's *De Oratore;* selections from Quintilian's *Institutes* and from Tacitus' *Dialogus de Oratoribus* are read in Latin.

227. Graduate Reading in Latin. No credit. A special course to prepare Ph.D. candidates for the reading examination in Latin.

231. Satire. I. 3 hr. PR: Latin 109, 110, or equiv. Greek satirical writings and the origin of the Roman satire. Selections in Latin from the *Satires* and *Epistles* of Horace, and from the *Satires* of Persius and Juvenal.

234. History. I. 3 hr. PR: Latin 109, 110, or equiv. The origin and development of Roman historiography and its Greek antecedents. Selections in Latin from Livy's *History*, from Tacitus' *Agricola*, and from Suetonius' *Julius Caesar.*

235. Epic. I. 3 hr. PR: Latin 109, 110, or equiv. The origin and development of The Greek and Roman epic. Selections from Vergil's *Aeneid*, from Lucretius' *De Rerum Natura*, and from the earlier and later epic poets in Latin.

236. Philosophy. II. 3 hr. PR: Latin 109, 110, or equiv. The origin and development of Greek philosophy and its influence upon Roman philosophy. Selections from Cicero's *Tusculan Disputations* on the immortality of the soul and from Seneca's *Epistles* in Latin.

292. Pro-Seminar in Latin Literature. 1-6 hr. Special topics.

301. Thesis. 3-6 hr.

392. Seminar in Latin Literature. 1-6 hr. Special topics.

GREEK

292. Pro-Seminar in Greek Literature. 1-6 hr. Special topics.

392. Seminar in Greek Literature. 1-6 hr. Special topics.

LINGUISTICS

201. Linguistics as Applied to Spanish American Dialects. I. 3 hr. PR: A.B. in Spanish or consent. For students majoring in Latin American Area Studies to acquaint them with the principles of structural linguistics and those points of structure and vocabulary in which American Spanish differs from standard Castilian.

211. Middle High German. I. 3 hr. PR: 12 hr. of German from upper division. Study of the linguistic developments of Middle High German from the eleventh to the fifteenth centuries with illustrative readings from the *Nibelungenlied.*

212. Middle High German. II. 3 hr. Continuation of Linguistics 211 with illustrative readings from the Middle High German lyric poets and the courtly epics.

225. Comparative Grammar of Greek and Latin. I. 3 hr. PR: Consent.

226. Italic Dialects. II. 3 hr. PR: Consent.

227. Vulgar Latin. II. 3 hr. PR: Latin 109, 110, or equiv. Selections from Latin inscriptions and later Latin literature are studied to illustrate the development of the Latin language from its earliest times to its passing into the Romance languages.

231. *See French* 231.

241. *See French* 241 *and Spanish* 241.

251. History of the German Language. I. 3 hr. PR: 18 hr. of German or consent. A study of the historical development of standard German with emphasis on its relationships to the other Germanic languages and dialects.

252. Comparative Germanic Linguistics. II. 3 hr. PR: Linguistics 251 or consent. A comparative study of Gothic, Old English, Old Norse, Old High German, and Old Saxon.

255. History of the Spanish Language. I. 3 hr. PR: A.B. in Spanish or consent. A study of the development of the Spanish language and of the transformation of the Castilian dialect into the national language of Spain.

271. Old English I. 3 hr. PR: Consent. Elementary study of Old West Saxon with illustrative materials from prose and poetry.

272. Old English. II. 3 hr. Continuation of Linguistics 271. Comparison of the Old English dialects, with extensive illustrative readings, especially in *Beowulf*.

281. Old Norse. I. 3 hr. PR: Consent. Elementary study of Old West Norse prose.

282. Old Norse. II. 3 hr. Continuation of Linguistics 281. Readings in various Old Icelandic sagas; introduction to Old Norse poetry.

285. Elementary Sanskrit. I. 3 hr. PR: Consent.

286. Elementary Sanskrit. II. 3 hr. Continuation of Linguistics 285.

290. Old French. II. 3 hr. PR: Consent.

292. Pro-Seminar in Linguistics. 1-6 hr. Special topics.

296. Old Spanish. II. 3 hr. PR: Consent.

392. Seminar in Linguistics. 1-6 hr. Special topics.

LANGUAGE TEACHING METHODS

221. Methods and Materials in the Teaching of Foreign Language. I. 3 hr. Required of all prospective elementary and secondary school teachers majoring in foreign language.

222. Language Laboratory Techniques. II. 3 hr. Required of all candidates for a graduate degree in a foreign language.

242. See *French* 242 and *Spanish* 242.

270. Problems in Teaching Foreign Languages in the Elementary School (French, Spanish, German, Russian). 3 hr. PR: Consent. A methods course in the teaching of foreign languages with a demonstration class of elementary school pupils.

BIBLIOGRAPHY AND RESEARCH

265. Methods of Research. I. 3 hr.

LATIN AMERICAN AREA STUDIES

The Master of Arts degree in Latin American Area Studies is an interdisciplinary degree. It is based on 39 credit hours, six of which may be obtained in residence at a selected Latin American University.

The courses are intended for graduate students who hold a bachelor's degree, preferably with a major in Spanish, History, Economics, Political Science, Geology, or Sociology, and who wish to prepare themselves for some type of work in Latin America.

Each candidate accepted will be assigned to a committee composed of at least one member from the Department of Foreign Languages and other members from the supporting departments.

The objectives of the program are: to make sure the student has a thorough knowledge of Spanish for all purposes, to furnish the student a good background in Latin American culture, and to give the student a sound basis for future teaching, research, or other professional work requiring knowledge of Latin America.

Basic requirements for all candidates are: Spanish 217, 218, 297, 397, Linguistics 201, Geography 219.

Additional courses under this program are grouped as follows:

Group I. History 220, 221, Political Science 246, 255, 267.

Group II. Economics 250, 251, Sociology 260, and six hours of special courses in Anthropology.

Group III. Art 275, Botany 296, Agriculture 320, three hours of special work in Pathology.

The student may complete the requirements for his degree in either of the following ways:

(1) At least nine hours from Group I and three hours from Group III, plus additional courses from Groups I, II, or III as desired.

(2) At least nine hours from Group II and three hours from Group III, plus additional courses from Groups I, II, or III as desired.

GEOLOGY AND GEOGRAPHY

The Department of Geology and Geography offers work leading to the degrees of Master of Arts, Master of Science, and Doctor of Philosophy in Geology.

The Degree of Master of Arts

This degree enables the holder of a baccalaureate degree to become well acquainted, although not professionally trained, in the earth sciences. The program is directed toward teachers, businessmen, and research administrators.

Acceptance by the Graduate School and also by the Department of Geology and Geography is necessary before admission of any prospective student to the program. One departmental requirement is previous college study of scientific subjects. This requirement may be fulfilled by an undergraduate major (or first teaching field) in biology, chemistry, physics, or engineering.

The minimum course work involved is 36 hours (32 of which are at graduate level). This includes 24 hours of specified work, and allows 12 or more hours in optional and related areas (at least 3 hours of which are in geology). Up to 9 hours of cognate work at the graduate level (in biology, chemistry, physics, engineering, mathematics, or education) may be included in the program. No thesis is required. The degree program may be completed during residence in one Summer Session and two regular semesters.

The Degree of Master of Science

Before being admitted to candidacy for the Master of Science degree in Geology, the student must have completed the equivalent of the courses listed in the *Announcements* of the College of Arts and Sciences as curricular requirements for undergraduates majoring in Geology. Students who have not had more than a year

of physics, a year of chemistry, and mathematics through Math. 15 (Calculus I), will be required to meet these requirements. They therefore will spend more than the minimum time for the Master of Science or Doctor of Philosophy degrees. Most employment requirements in technical fields, such as petroleum geology, now include not only advanced physics and chemistry but also mathematics through calculus. Employment opportunities are limited unless this requirement is met. Graduate students are expected to take some supporting courses in such allied fields as mining engineering, geophysics, and biology—depending on their major field of geologic studies.

A grade-point average of at least 3.0 (B) is required for an advanced degree in all courses in geology taken in the department while a graduate student. Scores in the general aptitude and geology tests of the Graduate Record Examination must be submitted. Each student must pass satisfactorily a comprehensive qualifying examination as an additional requirement before being admitted to candidacy for an advanced degree.

A thesis is required of all candidates for the Master of Science degree in geology. The thesis may be based on field work done while not in residence at the University by arrangement with the candidate's advisory committee. Final examinations (usually oral) on general geologic knowledge and thesis subject must be passed by each candidate for an advanced degree.

Prospective students are urged to write the Chairman of the Department of Geology before making application to the Director of Admissions of the University for admission to the Graduate School.

The Degree of Doctor of Philosophy

In addition to the requirements above, the general requirements for the Doctor's degree are set forth in Part II.

Opportunities for Research

Close cooperation between the West Virginia Geological and Economic Survey, located in Morgantown, and the Department of Geology makes a large amount of material available for laboratory investigation. This includes the fossil collections of the Department and the Survey. A large number of samples of drill cuttings from deep wells in West Virginia and adjoining states are housed in the Survey. Morgantown is conveniently situated for detailed studies of Mississippian, Pennsylvanian, and Permian formations. Mineral products of the region near Morgantown include coal, petroleum, natural gas, and limestone. The occurrence and utilization of these materials can be studied by graduate students interested in economic geology. A permanent summer field camp (Camp Wood) is located in the Folded Appalachians at Alvon, Greenbrier County, West Virginia.

201. Physical Geology for Teachers. I, II, S. 3 hr. PR: High School teaching certificate, and consent. Composition and structure of earth and the geologic processes which shape its surface.

202. Physical Geology Laboratory for Teachers. I, II, S. 1 hr. Accompanies Geol. 201. Laboratory and field study of earth materials and features, and the topographic and geologic maps used to represent them.

216. Urban Geography. II. 3 hr. Study of the location, development, and change of urban land use patterns.

219. Problems in Geography. I, II. 1-3 hr. per sem. PR: Consent.

221. Geomorphology. I. 3 hr. Study of surface features of eastern United States.

222. Geomorphology. II. 3 hr. Study of surface features of western United States.

228. Photogeology. II. 3 hr. PR: Geol. 127, 151. Instruction in basic and advanced techniques of air photo interpretation.

231. Invertebrate Paleontology. II. 4 hr. PR: Geol. 3, 4. Invertebrate fossils; biologic classification, evolutionary development, and use in correlation of strata.

235. Introductory Paleobotany. I, II. 4 hr. PR: Geol. 3 and/or Bot. 2. Resume of development of principal plant groups through the ages, present distribution, mode of occurrence and index species, methods of collection.

261. Stratigraphy and Sedimentation. II. 3 hr. Study of sediments and sedimentary rocks. Field techniques stressed as data gathered and interpreted from rocks of Pennsylvanian age in Morgantown vicinity. Two-day field trip required.

263. Ground-water Hydrology. I. 3 hr. PR: Geol. 1 or consent. Study of the principles of ground-water hydrology; occurrence, development, uses, and conservation of ground-water.

266. Appalachian Geology Field Camp. S. 6 hr. PR: Geol. 231, 261. Practical experience in detailed geological field procedures and mapping. Living expenses in addition to tuition must be paid at time of registration.

269. X-Ray Diffraction. I, II. 2 hr. The theory of X-ray diffraction and application to the analysis of crystalline materials using the powder camera and X-ray diffractometer. Open to advanced students in geology, chemistry, engineering and related fields with consent of instructor.

270. Mineral Resources. I, S. 3 hr. PR: Geol. 1, 2. General survey of character, origin, and distribution of natural mineral resources, including mineral fuels, nonmetallic minerals, ore deposits, and ground-water.

272. Petroleum Geology. II. 3-4 hr. PR: Geol. 151. Origin, geologic distribution, methods of exploration and exploitation, uses and future reserves of petroleum and natural gas in the world.

285. Optical Mineralogy. I. 4 hr. PR: Geol. 185 and one year of Physics. Principles and practice in use of the petrographic microscope in identification of minerals. Emphasis on determination by immersion method.

290. Geologic Problems. I, II. 1-6 hr. Special problems for seniors and graduates.

291. Seminar. I. 1 hr.

294. Introductory Geochemistry. I. 3 hr. PR: Geol. 185 or consent. Evolution of earth as suggested by chemical and physical data, followed by topics of current interest, including geologic thermometry, oxidation potential and pH, and geochemical prospecting.

295. Geochemistry. II. 3 hr. PR: Geol. 185 or consent. Mineral systems at low temperatures and low pressures considered in terms of partial pressure, oxidation potential, and pH. Laboratory study includes directed investigation of a topic of interest to the student.

329. Problems in Geomorphology. I, II. 1-4 hr.

332. Micropaleontology. I. 4 hr. PR: Geol. 231. Identification of Foraminifera and Ostracoda; emphasis on classification, nomenclature, and use of paleontological literature.

334. Problems in Paleontology. I, II. 1-4 hr.

336. Advanced Paleobotany. I, II. 4 hr. Continuation of Geol. 235.

339. Problems in Paleobotany. I, II. 1-4 hr.

340. Advanced Stratigraphy. II. 4 hr. PR: Geol. 231. Study of principles of rock and time correlation, emphasis on their application to the stratigraphy of West Virginia.

346. Advanced Sedimentation. I. 4 hr. PR: Geol. 185. Origin of sedimentary rocks; principles involved in interpretation of ancient geography, climates, animals, and plants.

348. Problems in Sedimentation. I, II. 1-4 hr.

349. Problems in Stratigraphy. I, II. 1-4 hr.

351. Tectonic Elements. II. 3 hr. PR: Geol. 151. Detailed analyses of tectonic elements of North America and Europe.

359. Problems in Structural Geology. I, II. 1-4 hr.

366. Problems in Field Geology. I, II. 1-6 hr.

371. Economic Geology: Ore Deposits. II. 3 hr. PR: Geol. 185. Mineral composition, geologic features, and distribution of deposits of principal useful metallic minerals.

372. Economic Geology: Nonmetallics. I. 3 hr. PR: Geol. 185. Occurrence, formation, and use of nonmetallic mineral substances, including building materials and chemicals.

374. Problems in Economic Geology and Geochemistry. I, II. 1-4 hr.

386. Petrology. II. 4 hr. PR: Geol. 285. Composition, texture, occurrence, and origin of rocks. Study of hand specimens and thin sections.

387. Advanced Petrology. I. 3 hr. PR: Geol. 386. Study of the composition, classification, and origin of igneous and metamorphic rocks. Laboratory work consists of a study of crystalline rocks by microscopical methods.

388. Problems in Mineralogy and Petrology. I, II. 1-4 hr.

397, 398. Research. I, II. 1-6 hr. Specialized work for advanced students based upon field or laboratory evidence and reported upon in candidacy for master's degree.

399. Research. I, II. 1-15 hr. per sem., 30 hr. max. Open only to Ph.D. candidates.

HISTORY

The Degree of Master of Arts

Candidates for the Master's degree should have had 18 hours of upper-division undergraduate work in history and 9 hours of upper-division undergraduate work in some closely related subject, preferably economics, political science, or sociology. A reading knowledge of one foreign language is desirable.

The Department of History requires that all candidates for the Master of Arts degree in history present an overall average of 3.0 (B) for all graduate courses taken; it will not accept toward an advanced degree credits in courses offered by the Department of History which are reported with a grade lower than "B."

Early in the course the candidate should select a thesis subject, the development of which will require research of at least a semi-independent character. Before the degree is conferred the candidate will be required to pass a satisfactory examination in the field of his thesis and such related fields as may be determined by him in conference with his departmental adviser.

The thesis must be in the hands of the departmental adviser at least thirty days before date of the oral examination, which will be conducted by a committee selected by the adviser and approved by the Dean of the Graduate School. Four hours credit will be allowed for an acceptable thesis. With the approval of the adviser, the candidate for the Master's degree may substitute course work for the thesis requirement, provided that he shall have satisfactorily completed 36 semester hours of graduate study, which shall include a minimum of 24 hours in History, at least 6 of which shall include courses of the 300 seminar series. Those electing to obtain the Master's degree by this option will be required to pass a final comprehensive examination (either oral, written, or both) in the fields covered by the course work.

The Degree of Doctor of Philosophy

A candidate for the Doctor's degree must offer a program of study in at least four fields, three of which must be in history and the other may be in a related field in another department. The program must be approved by the departmental ad-

viser and the Dean of the Graduate School, but not until the candidate has shown his ability to pursue it by a qualifying examination, given by a committee of the Department, to determine his general knowledge of the entire field of history.

In addition to the qualifying examination, a candidate for the degree shall submit, before the end of the first year of his residence, a piece of research approved by the departmental adviser to satisfy the Department of History of his fitness to proceed with graduate work. After a period of residence, but not until he shall have met the University requirement of ability to read two foreign languages, the candidate will be required to take a comprehensive preliminary examination (oral, written, or both) in four fields, of which three must be in history.

The groups from which the fields may be selected are:

Group A
History of the United States to 1865
History of the United States since 1850

Group B
Medieval and Renaissance Europe
Europe, 1500-1815
Europe, 1789 to Present
History of England

Group C
Latin America
History of Asia
Field in another department

Besides conforming to general regulations of the Graduate School, the doctor's dissertations must show: (1) a thorough mastery of the original sources of information; (2) good literary form or style; and (3) an acceptable standard of documentation, to the end that all important statements of fact may be verified. Upon the satisfactory completion of the dissertation, the candidate is required to take a final oral examination. This examination is designed to bring out the candidate's critical ability and reasoning power and is based on the field covered by the dissertation.

202. Medieval Cultural History. 3 hr.

203. The Renaissance and the Reformation. 3 hr.

204. English Social History, 14th to 18th Century. 3 hr.

205. English Social History, 18th Century to the Present. 3 hr.

206. French Revolution and Napoleon. 3 hr.

207. History of Modern France. 3 hr.

208. History of Russia from Ancient Times to Alexander III. 3 hr.

209. History of Russia: The Revolutionary Era and the Soviet Period. 3 hr.

210. European Diplomatic History, 1815 to 1919. 3 hr.

211. European Diplomatic History, 1919 to Present. 3 hr.

215. Problems of the Pacific. 3 hr.

230. The ABC Powers of Latin America. 3 hr.

250. Economic and Social Development of West Virginia. 3 hr.

253. The American Frontier East of the Mississippi. 3 hr.

254. The American Frontier West of the Mississippi. 3 hr.

256. The Old South. 3 hr.

257. The American Civil War. 3 hr.

258. The New South. 3 hr.

259. The United States from McKinley to the New Deal, 1898 to 1933. 3 hr.

260. American Diplomacy to 1901. 3 hr.

261. American Foreign Policy and Diplomacy, 1901 to the Present. 3 hr.

269. Recent American History, 1933 to the Present. 3 hr.

279. American Economic History to 1865. 3 hr.

280. American Economic History since 1865. 3 hr.

281. The American Labor Movement. 3 hr.

290. Intellectual and Social History of the United States to 1876. 3 hr.

291. Intellectual and Social History of the United States since 1876. 3 hr.

302, 303. Readings, Seminar, in Medieval History. 3 hr. per sem.

304, 305. Readings, Seminar, in English History. 3 hr. per sem.

306, 307. Readings, Seminar, in Western European History. 3 hr. per sem.

308, 309. Readings, Seminar, in Central European History. 3 hr. per sem.

310, 311. Readings, Seminar, in Eastern European History. 3 hr. per sem.

312, 313. Readings, Seminar in Asian History. 3 hr. per sem.

349, 350. Problems in Local and Regional History. 3 hr. per sem.

351, 352. Readings, Seminar, in American History, 1492-1789. 3 hr. per sem.

353, 354. Readings, Seminar, in American History, 1763-1865. 3 hr. per sem.

355, 356. Readings, Seminar, in American History, 1850-1898. 3 hr. per sem.

357, 358. Readings, Seminar, in American History, 1890 to the Present. 3 hr. per sem.

359, 360. Readings, Seminar, in Frontier History. 3 hr. per sem.

361. The History of American Agriculture. 3 hr.

362. The Cleveland Era. 3 hr.

376. American Historiography. 3 hr.

377. European Historiography. 3 hr.

391, 392. Thesis. 1-6 hr.

393, 394. Research. 1-15 hr., max. 15 hr. per sem.

LIBRARY SCIENCE

Admission Requirements: Students wishing to do graduate work in Library Science must satisfy the general requirements for admission to the Graduate School.

The Department of Library Science offers a graduate program which culminates in a Master's degree. The Master of Education degree is granted in conjunction with the College of Education and the Graduate School.

The student will be admitted to the graduate program when he has met the following Departmental requirements:

(1) A Bachelor's degree from an approved college or university with evidence of 12-18 hours of course work in undergraduate Library Science. (Students lacking appropriate undergraduate courses may correct their deficiency by registering for prerequisite courses offered by the Department.)

(2) A broad cultural background, with a field of specialization.

(3) Evidence of ability to undertake the completion of the Library Science program as well as promise of professional proficiency as shown by previous academic record.

(4) A personal interview whenever possible.

Degree Requirements: The candidate for the Master of Arts in Education degree with a field in Library Science will be required to complete 30 semester credits of graduate study consisting of:

(1) a. Eighteen graduate credits in Library Science, with an average of B, of which at least 3 credits will be in courses of "300" number; *or,*

b. Twelve graduate credits in Library Science, with an average of B, of which at least 3 hours will be in courses of "300" number, and 6 graduate credits in a related field (with faculty adviser approval), with an average of B.

(2) a. Nine credits in Education, with an average of B, to include 3 hours of required audio-visual and 6 hours of electives.

b. A 3-credit problem report (Ed. 360) in some phase of librarianship; thus completing the 30 semester credits necessary for the degree.

203. Library Materials for Children. I, S. 3 hr. A survey of the development of children's literature with emphasis on modern books.

205. Selection of Books and Related Materials for The Secondary School Library. A survey of adolescent literature and other library materials adapted to the needs of high school students.

207. School Library Organization and Administration. I, S. 3 hr. A study of the organization and administration of school libraries including planning of rooms, equipment, routines, and schedules.

221. Public and Regional Library Service. S. 3 hr. PR: Consent. Principles governing the administration of tax-supported public libraries and the development of larger units of service.

222. Field Practice. I, II, S. 3 hr.

223. Cataloging and Classification. I, S. 3 hr. Basic principles of cataloging and classification combined with practical experience in processing the various types of books and materials.

224. History of Books and Libraries. II, S. 3 hr.

225. Books and Reading for Adults. II, S. 3 hr. Reading and evaluation of representative books in broad subject fields.

226. Literature of the Social Sciences. II, S. 3 hr. PR: Consent. An approach to the selection and use of books and materials in the social sciences.

227. Literature of the Humanities. II, S. 3 hr. Bibliographical and other reference sources in the major subject areas of the humanities, including religion, philosophy, fine arts, music, and literature.

228. Literature of Science and Technology. II, S. 3 hr. PR: Consent. A course designed to give the student a good working knowledge of the increasingly complex literature of science and technology.

230. Library Resources for the School Curriculum. I. 3 hr.

235. Library in the Elementary School. II. 2 hr. PR: Lib. Sci. 203.

304. Advanced Cataloging and Classification. II, S. 3 hr. PR: Lib. Sci. 223.

309. Seminar. I or II, S. 2 hr. (Max. credit, 4 hr.). Required of all majors in Library Science.

310. Special Topics. 1-3 hr. PR: Lib. Sci. 309. A thorough study of some phase of library science based on the needs and interest of the individual.

311. Problem Report. (Ed. 360). 3 hr. PR: 6 hours of Education courses, Lib. Sci. 309.

Required Courses In Education 6 Hr.

Ed. 221—Audio-visual Resources in Education 3
Ed. 360—Problem in Education (Library Science) 3

Electives From This Group 6 Hr.

Ed. 271—Educational Measurements 3
Ed. 331—Philosophy of Education 3
Eo. 339—Public-school Organization and Administration 3
Ed. 348—Human Development and Behavior 3
Ed. 373—Basic Course in Guidance 3
Ed. 385—Historical and Sociological Foundations of American Education 3

MATHEMATICS

Graduate students in mathematics must pass a qualifying examination before becoming candidates for the Master's degree. This examination is held in October, February, and June. Its purpose is to check on the student's undergraduate background and test his fitness to pursue graduate work in the Department. A student is not eligible to take his final oral examination the same semester (or summer) he passes his qualifying examination.

The Department of Mathematics offers two Master's degrees, the A.M. and the M.S. The A.M. degree is intended for those who expect to continue the study of mathematics at the doctoral level and the requirements have been set up accordingly. The M.S. degree is planned as a terminal degree and should suit the requirements of those students who expect to enter industrial work, research laboratories, statistics, teaching, computer centers, actuarial analysis, and other situations requiring special mathematics training beyond that included in the undergraduate major.

Departmental Requirements

(a) The A.M. degree (preparation for doctoral work in mathematics).

A minimum of 30 hours credit is required for the A.M. degree. At least 18 hours of this minimum must be in the "300" series of mathematics courses; six hours in each of three of the following fields: algebra, analysis, geometry, topology, applied mathematics. No more than six hours of "200" level courses in mathematics may be credited towards the A.M. degree. A thesis is optional.

Students lacking prerequisites for regular graduate courses may find it necessary to take one or more "200" level courses without graduate credit.

(b) The M.S. degree (training other than predoctoral).

A minimum of 30-36 hours credit, depending upon the previous preparation of the student, is required for the M.S. degree.

A minor, which is not required, usually of six hours in a related field either "200" or "300" level courses, may be approved as part of the requirements for the degree. The minor may be more or less than six hours.

220, 221. Numerical Analysis. I, II. 3 hr. per sem. PR: Math. 117 and pre- or corequisite Math. 110 or I.E. 180, or consent. The composition, propagation, and generation of error. The discrete finite difference calculus. Polynomial approximation including interpolation, numerical differentiation and integration, numerical solution of differential equations, least squares, Chebyshev polynomials. Non-polynomial approximation. Numerical solution of equations and systems of equations. Eigenvalue problems, Random numbers, and Monte Carlo Methods.

225. Theory of Games. II. 3 hr. PR: Math. 117 or consent. Elements of Matrix Algebra and Probability. Theory of Games, including decision theory, linear and dynamic programming, and strategy.

230, 231. Theory of Numbers. I, II. 3 hr. per sem. PR: One year of calculus. Introduction to classical number theory, covering such topics as divisibility, the Euclidean algorithm, Diophantine equations, congruences, primitive roots, quadratic residues, number-theoretic functions, distribution of primes, irrationals, and combinatorial methods. Special numbers, such as those of Bernoulli, Euler, Stirling.

232. Mathematical Statistics. II. 3 hr. PR: Math. 117. Discrete and continuous variables; correlation, regression, sampling theory, normal, chi-square, t, and F distributions; significance tests; analysis of variance.

235. Foundations of Algebra and Analysis. II. 3 hr. PR: Math. 117 or consent. Algebra of sets; propositional calculus; elementary topology, real number system; functions.

236. Introduction to Algebraic Structures. I, II. 3 hr. PR: Math. 117 or consent. A basic study of groups, rings, integral domains, fields, and polynomial rings. Special consideration of the real and complex fields and related topics.

237. Introduction to Linear Algebra. II. 3 hr. PR: Math. 117 or consent. A study of vector spaces, matrices, determinants, linear transformations, linear programming, bilinear and quadratic forms, and related topics.

238. Modern Geometry for Teachers. II. 3 hr. PR: Math. 117 or consent. For high school teachers. Foundations of geometry. Special topics from Euclidean, projective, and non-Euclidean geometries.

240. Differential Equations. I, II. 3 hr. PR: Math. 117. First course. Types of ordinary differential equations of first or higher degree and of first or higher order. Solutions and applications. Not open to students with credit for Math. 253.

242. Advanced Real Calculus. I. 3 hr. PR: Math. 117. This is a preparatory course for Math. 256. Fundamental principles of limits, derivatives, integrals and series.

243. Projective Geometry. II. 3 hr. PR: Math. 236. Projective, affine, and metric geometries of the line, plane, and space; conics and quadrics.

245. Vector Analysis. I. 3 hr. PR: Math. 240 or 253. Vector definitions and operations, differentiation, operator del, integration, generalized coordinates, irrotational and solenoidal vectors, electrostatic fields, potentials.

247. Theory of Numbers. S. 3 hr. PR: Math. 117. Divisibility, distribution of primes theory of congruences, theory of quadratic residues, arithmetical properties of the roots of unity. Diophantine equations, and the prime number theorem.

248. History of Mathematics. S. 3 hr. PR: Math. 15. Survey of the development of mathematics through the calculus, with emphasis on the mathematical theories and techniques of each period and their historical evolution.

251, 252. Advanced Calculus. I, II. 3 hr. per sem. PR: Math. 117. A study of sequences, limits, continuity, definite integral, convergence, differentiation, differentials, functional dependence, multiple integrals, line and surface integrals, and differential forms.

253. Advanced Course in Applied Mathematics. I. 3 hr. PR: Math. 117. Determinants and matrices; ordinary differential equations of the first order, linear differential equations with constant coefficients, simultaneous linear differential equations, applications; mechanical and electrical circuits; Fourier series and integrals.

254. Advanced Course in Applied Mathematics. II. 3 hr. PR: Math. 253. Finite differences, partial differential equations, Bessel functions and Legendre polynomials. Vector analysis.

256. Introduction to Complex Variables. II. 3 hr. PR: Math. 242 or 252. An introductory course intended primarily for students in engineering and physics. Elementary principles, conformal mapping, and applications.

259. Introduction to the Laplace Transform. II. 3 hr. PR: Math. 240 or 253. An introduction at the undergraduate level to the theory and applications of the Laplace transform.

261, 262. Special Topics. S. 2-4 hr. PR: Math. 117 or consent. Primarily for secondary school teachers. Topics in modern mathematics. Content may vary with the needs of the student.

263. Special Topics. II. 2-3 hr. PR: Math. 262 or consent. Sets and relations; axiomatization of a mathematical system; algebraic structure; real number system; and critical study of the foundations of Euclidean geometry.

264, 265. Foundations of Algebra. S. 2 hr. PR: Differential and integral calculus. Not open to students with credit for Math. 236. Introduction to algebraic structures: rings, the integral domain of integers, properties of the integers, fields, polynomials over a field, groups; matrices; linear systems; vector spaces; vector geometry; linear transformations; and linear programming.

266, 267. Foundations of Geometry. S. 2 hr. PR: Differential and integral calculus. A study of affine, projective, Euclidean, and non-Euclidean geometries.

268, 269. Probability and Statistics. S. 2 hr. PR: Differential and integral calculus. Finite sample space, measure of the set of outcomes and probability of events, independent trials, functions on the sample space, approximations to the binomial distribution, elementary statistical inference, continuous sample spaces, limit theorems, stochastic processes, statistical models, and applications.

270, 271. Introduction to Mathematics for the Elementary Teacher. I, II. 3 hr. per sem. PR: Math. 6 or consent. Systems of numeration; sets, relations, binary operations, decimal and other base systems; natural numbers, integers, rational numbers, and real numbers with emphasis on the algebraic structure of each; the notions of length, area and volume; pythagorean theorem; and coordinate geometry.

308. Theory of Probability. I. 3 hr. PR: Math. 117. Fundamental theorems. Development of density and distribution functions in the discrete and continuous cases. Classical problems and solutions. Moments, characteristic functions, limit theorems. Applications.

309. Group Theory. II. 3 hr. PR: Math. 236 or consent. Order, index, coset, normal subgroup, factor group, homomorphism; direct product; fundamental theorem of Abelian groups; endomorphism and automorphism; groups with operators; normal series; and Jordan-Holder theorem.

311, 312. Introductory Topology. I, II. 3 hr. per sem. PR: Math. 252 or consent. An axiomatic treatment of topological spaces including metric spaces. A detailed study of convergence, connectivity, continuity, and related topics.

313. Advanced Differential Equations. II. 3 hr. PR: Math. 240, 252. Second-order linear equations, Riccati equations, complex variables. Series solutions. Equations of Fuchsian type, hypergeometric equation, confluence of singularities. Classical equations, applications.

314. Tensor Analysis. II. 3 hr. PR: Math. 245, 252. Vector concept developed from standpoint of algebraic invariants, surface geometry, tensor operators, curvature tensor. Ricci and Bianchi identities, applications of tensors to physical phenomena.

315. Calculus of Variations. II. 3 hr. PR: Math. 240, 252. Maximum and minimum value of an integral, shortest distance, the brachistochrone problem, surfaces of revolution of minimum area, conditions for a relative minimum. Applications.

320, 321. Special Functions. I, II. 3 hr. PR: Math. 240, 252. Operational techniques; generalized hypergeometric functions; classical polynomials of Bell, Hermite, Legendre, Noerlund, etc. Introduction to recent polynomial systems. Current research topics.

331, 332. Theory of Partial Differential Equations. I, II. 6 hr. PR: Math. 240, 252, or equiv. Elementary concepts; Cauchy problems; the Cauchy-Kowalewski theorem; general existence theorems; associated surfaces; classification into elliptic, parabolic, and hyperbolic types; conditions required of coefficients for solvability; techniques for solution; distribution theory; and numerical methods.

351, 352. Algebraic Geometry. I, II. 3 hr. per sem. PR: Math. 243, 236. Characteristic properties and representations of curves and surfaces, algebraic correspondences; linear systems; enumerative geometry.

353. Linear Algebra. II. 3 hr. PR: Math. 236 or consent. Review of theory of groups and fields; linear vector spaces including the theory of duality; full linear group; bilinear and quadratic forms; and theory of isotropic and totally isotropic spaces.

357. Fourier Series and Partial Differential Equations. I. 3 hr. PR: Math. 240 (or 253), 252 (or 242). Partial differential equations of physics, orthogonal sets; the generalized Fourier series; Fourier series, and their properties; Fourier integrals; Boundary value problems; Bessel functions and Legendre polynomials; uniqueness of solutions.

358. Operational Methods in Partial Differential Equations. II. 3 hr. PR: Math. 240 (or 253), 252 (or 242). Laplace transformation, properties and elementary applications; problems in partial differential equations, complex variable; problems in heat condition, mechanical vibrations, etc. Sturm-Liouville systems. Fourier transforms.

360, 361. Differential Geometry and Theory of Surfaces. I, II. 3 hr. per sem. PR: Math. 240, 243. Metric properties of space curves and surfaces by differential methods. Parametric representation, curvature, torsion, trihedrons, geodesics, transformations, conformability, developability, ruled surfaces.

362, 363. Introduction to Modern Algebra. I, II. 3 hr. PR: Math. 236 or consent. Concepts from set theory and the equivalence of the Axiom of Choice, Zorn's Lemma, and the Well-Ordering Theorem; a study of the structure of groups, rings, fields, and vector spaces; elementary factorization theory; extensions of rings and fields; modules and ideals; and lattices.

364, 365. Theory of Functions of Complex Variables. I, II. 3 hr. per sem. PR: Math. 240, 252. Complex numbers; functions of a complex variable; fundamental theorems of Cauchy; conformal representation with applications; analytic continuation; calculus of residues; Gamma, Bessel, and elliptic functions.

366, 367. Higher Plane Curves. I, II. 3 hr. per sem. PR: Math. 243. Algebraic plane curves. General theory of curves, singularities, relationships, associated curves; detailed study of curves of third and fourth order.

376, 377. Theory of Functions of a Real Variable. I, II. 3 hr. per sem. PR: Math. 235, 236, and 252. Review of elementary point set concepts. Necessary and sufficient conditions under which operations of previous analytical subjects are valid. Different theories of integration.

380. Thesis. I, II. 1-6 hr.

ASTRONOMY

216. Astronomy for Teachers. S. 3 hr. Introduction to astronomy with special emphasis on the needs of physical science teachers and science club directors. Not open to students with credit for Astronomy 106.

255. Mathematical Astronomy. II. 3 hr. PR: Astronomy 106, Math. 240. Development of the implications of Kepler's Laws and Newton's Law of Gravitation.

PHILOSOPHY

Philosophy seeks to discover the defensible foundations of belief and action.

Admission. Acceptance of a student will be based on (1) a Bachelor of Arts Degree with a minimum grade-point average of 3.0; (2) adequate academic aptitude as measured by the Graduate Record Examination; and (3) references from persons who can attest to, and advise on, the applicant's ability to complete the degree program. A grade no lower than "B" in all courses taken at the graduate level is required.

The M.A. Degree. To obtain the Master of Arts degree in Philosophy, (1) a minimum of 30 semester hours of course work beyond the Bachelor's Degree is required; (2) a reading knowledge of some language, preferably French or German, is required; (3) a thesis must be submitted; and (4) an oral examination on the thesis must be passed.

205. Philosophy of Mind 1. I or II. 3 hr. PR: Philos. 4 and Philos. 116. Typical problems in this course have to do with whether there are minds, the difference between minds and bodies, other minds, and the analysis of mental concepts.

206. Symbolic Logic 2. I or II. 3 hr. PR: Philos. 106. Formalization of the material in the previous term, the concepts of consistency, decidability and completeness, and the elementary theory of classes.

207. Philosophy of Language 1. I or II. 3 hr. PR: Philos. 106, Philos. 116 or consent. An analysis of the nature of meaning and language.

208. Philosophy of Religion. I. 3 hr. PR: Philos. 4 and Philos. 112 or 113. An attempt to discover the defensible foundations of religion.

210. Philosophy of Science 1. I or II. 3 hr. PR: Philos. 4 and Philos. 106, or consent. An analysis of the conceptual and methodological foundations of science.

211. Greek Philosophy. I or II. 3 hr. PR: Philos. 4, 112, and 113.

212. Philosophy of History. I or II. 3 hr. PR: Philos. 104 and Philos. 112, 113, or consent. Typical theoretical problems such as the nature of historical explanation, relativism and the status of speculative principles of history.

213. Kant. I or II. 3 hr. PR: Philos. 104, 112, and 113.

214. Contemporary Philosophy 2. I or II. 3 hr. PR: Philos. 104 and Philos. 114, or 116. An exposition of contemporary schools of analytic philosophy.

216. Theory of Knowledge 2. II. 3 hr. PR: Philos. 4, Philos. 106, and Philos. 114 or Philos. 116. An analysis of the concepts of necessity and truth.

217. Metaphysics. I or II. 3 hr. PR: Philos. 4, Philos. 112 and Philos. 113. An analysis of the nature of existence and reality.

220. Rationalism. I or II. 3 hr. PR: Philos. 4, 112, and 113. Descartes, Spinoza, and Leibniz.

221. Empiricism. I or II. 3 hr. PR: Philos. 4, 112, and 113. Locke, Berkeley, and Hume.

222. Philosophy of Mathematics. I or II. 3 hr. PR: Philos. 206 or consent. An examination of contemporary viewpoints in the foundations of mathematics.

223. Theory of Value. II. 3 hr. PR: Philos. 4 and Philos. 107. A study of the normative disciplines in relation to human conduct.

224. Seminar. 2 hr. A study of selected topics.

225. Problems in Philosophy. I or II. 3 hr. PR: Philos. 4 and consent.

*301. Induction and Rational Belief. I or II. 3 hr.

*All courses numbered in the 300 series require departmental consent for admission.

302. Philosophy of Science. I or II. 3 hr.

303. Theory of Knowledge. I or II. 3 hr.

304. Symbolic Logic. I or II. 3 hr.

305. History of Philosophy. I or II. 3 hr.

306. Metaphysics. I or II. 3 hr.

307. Seminar 1. 3 hr.

308. Seminar 2. 3 hr.

309. Problems in Philosophy. I or II. 3 hr.

310. Ethics. I or II. 3 hr.

311. Philosophical Foundations of Psychology. I or II. 3 hr.

312. Thesis. 2-6 hr.

PHYSICS

A candidate for the degree of Master of Science in Physics should have had introductory work in mechanics, electricity, and modern physics as acquired in undergraduate courses in physics or in related sciences at an approved college or university. Physics Seminar and research leading to a thesis are required. The remaining credit to make a total minimum of 30 semester hours is chosen from the graduate courses in physics, mathematics, and other suitable sciences as approved by his adviser.

Applicants for the degree of Doctor of Philosophy will be required to pass a preliminary qualifying examination after one year of graduate work, to demonstrate reading proficiency in two languages (French, German, or Russian), to complete a minimum of 60 hours of graduate credit, to gain approval of his dissertation, and to pass a final oral examination.

201, 202. Special Topics. I, II. 1-3 hr. per sem.

213. Introductory Electronics. S. 3 hr. PR: 1 year college physics. Primarily for Education majors; not for graduate credit for science majors.

218. Dynamic Meteorology. II. 3 hr. PR: Physics 117 or equiv. and calculus. Dynamics of lower atmosphere relating to transport and dispersion of foreign matter.

221. Optics. II. 3 hr. PR: Calculus, Physics 11, 102, or equiv. Work with optical instruments, spectrometry, interferometry, and polarization.

225, 226. Modern Physics. I, II. 3 hr. per sem. PR: Calculus, Physics 11, 102, or equiv. Particle analysis, phenomena connected with the structure of the atom, and nucleus. Not open to those who have credit for 125 and 126.

231, 232. Theoretical Mechanics. I, II. 3 hr. per sem. PR: Calculus, Physics 11, 102, or equiv. Theorems and problems in intermediate mechanics.

233, 234. Introductory Electricity and Magnetism. I, II. 3 hr. per sem. PR: Calculus, Physics 11, 102, or equiv. Electrostatic, magnetostatics, network analysis, introduction of electrodynamics, and applications.

241, 242. Mechanics Laboratory. I, II. 1 hr. To accompany Physics 231, 232.

243, 244. Electricity Laboratory. I, II. 1 hr. To accompany Physics 233, 234.

245, 246. Modern Physics Laboratory. I, II. 1 hr. To accompany Physics 225, 226.

247, 248. Physics Seminar. I, II. No credit. Required of Junior, Senior, and Graduate physics majors.

254. Outline of Modern Physics. S. 3 hr. PR: 1 year of college physics, 1 year of college mathematics. Selected topics in modern physics. Primarily for Education majors; not open to physics majors.

255, 256. Workshop for Physics Teachers. SI, SII. 3 hr. PR: 1 year of college physics, 1 year of college mathematics. Techniques of apparatus construction and demonstration. Primarily for Education majors; not open to physics majors.

257. Photography. SI. 3 hr. PR: 1 year of physics or equiv. Primarily for Education majors; not open to physics majors.

258. Light. SII. 3 hr. PR: 1 year of physics or equiv. Primarily for Education majors; not open to physics majors.

261, 262. Molecular Physics. I, II. 3 hr. per sem. PR: Physics 225, 226. Molecular spectra, molecular structure and solid state physics.

271, 272. Solid State Physics. I, II. 3 hr. per sem. PR: Physics 225, 226. Theoretical concepts required for the understanding of the physical properties of simple crystalline solids.

283. Thermodynamics. I. 3 hr. PR: Calculus, Physics II, 102, or equiv. Application of First and Second Laws of Thermodynamics to physical systems.

284. Kinetic Theory. II. 3 hr. PR: Calculus, Physics II, 102, or equiv.. Boltzman distribution, viscosity, diffusion, thermal conductivity, specific heat.

287, 288. Introduction to Mathematical Physics. I, II. 3 hr. per sem. PR: Calculus, Physics 11, 102, or equiv. Boundary value problems in vibration, heat conduction, hydrodynamics, special relativity.

321, 322, Physical Optics. I, II. 3 hr. per sem. PR: Physics, and a course in differential equations.

331, 332. Advanced Classical Mechanics. I, II. 3 hr. PR: Calculus, Physics 231, 232. Lagrangian and Hamiltonian formulations of mechanics, Hamilton-Jacobi theory, small oscillations.

333, 334. Advanced Electricity and Magnetism. I, II. 3 hr. PR: Physics 233, 234, and differential equations. Wave propagation, electrodynamics of charged particles.

341, 342. Research Seminar. I, II. 3 hr. PR: Consent. Discussion of problems encountered in particular fields of research, and their relation to other areas of physics.

351, 352. Quantum Mechanics. I, II. 3 hr. per sem. PR: Physics 225, 226. Schroedinger's equations, hydrogen atom, perturbation, molecular forces.

353. Advanced Quantum Mechanics. I. 3 hr. PR: Physics 351, 352. Study of relativistic theory, many electron systems, introduction to quantum electrodynamics.

363, 364. Nuclear Physics. I, II. 3 hr. per sem. PR: Physics 225, 226. Theory of nuclear forces, transformation, energy levels.

383. Statistical Mechanics. II. 3 hr. per sem. PR: Physics 283, 352. Classical statistics, Boltzman, F-D, and B-E statistics, theory of fluctuations.

397, 398. Research. I, II. 1-6 hr. per sem. PR: Consent.

POLITICAL SCIENCE

The graduate program in political science at West Virginia University extends through the Doctor of Philosophy degree. With reference to departmental objectives, the emphasis is placed upon more extensive and intensive training than is possible on the undergraduate level. This involves: (1) the development of a broader knowledge of the literature of political science; (2) some degree of specialization in

one of the major areas of the disciplines; and (3) training in the identification and analysis of problems in governmental theory and practice. Graduate work in political science contributes to a general education and provides the foundation for more advanced work in the field. Leading professional possibilities for political science majors include teaching, the public service, and preparation for the legal profession.

The Degree of Master of Arts

Eligibility. Regular applicants for the Master of Arts degree should present a minimum of 12 semester hours of undergraduate credit in political science and at least 6 additional hours in some cognate field, including history, economics, sociology, psychology, philosophy, or social work. Students who do not meet the minimum requirements may, after consultation with the adviser, be admitted conditionally. In addition, a grade-point average of 2.5 should have been maintained as an undergraduate.

"Special" graduate students who are not working for an advanced degree may be admitted to courses for which they can satisfy the prerequisites.

Course Requirements. Admission to candidacy for the Master of Arts degree in political science is conditioned upon the completion of at least 30 hours of graduate work including a thesis. The candidate should present 18 semester hours of graduate course work in political science and 6 hours of similar work in a cognate field, such as economics, history, sociology, philosophy, psychology, social work or education. Exceptions to this general rule may be made by the departmental adviser in the case of students with an inadequate background in political science who transfer from other institutions or from other departments in West Virginia University. Normally the thesis will carry 6 hours credit. A reading knowledge of a foreign language is highly desirable.

Thesis and Final Examinations. In his graduate program, the student will write a thesis on a subject falling within his field of specialization. Fulfillment of the thesis requirement includes the following steps: (1) selection of a problem or topic for research in the problem area; (2) extensive reading and collection of data in the problem area; (3) organization, analysis, and evaluation of the data; (4) writing the thesis in correct form; (5) acceptance of the completed thesis by a committee composed of at least three faculty members, one of whom shall not be a member of the Department of Political Science, and (6) passing an oral or written examination or both, administered by the committee on the thesis and the major and minor fields.

Research on the thesis project will be done under the supervision of a staff member in whose field of specialization the thesis problem falls.

Students who fail to pass the final examination may appear for a second examination not earlier than the semester following that in which the first examination was given. It is contrary to departmental policy to give a third examination.

The Degree of Doctor of Philosophy

To gain admission to the program leading to the Doctor of Philosophy degree applicants must have completed the requirements for a master's degree, or the equivalent, at an approved institution as well as have demonstrated a capacity for graduate work in the Graduate Record Examination.

The program of courses will depend upon the individual needs of the student and the extent of his previous training in Political Science and related fields. Work leading to the doctoral degree consists of a minimum of three full years of graduate study—at least 60 semester hours after the bachelor's degree, in addition to research for the dissertation. Credits completed for a master's degree may be included in the doctoral program, with the exception of research credit granted for the master's thesis. Only credits with a grade of B or better in Political Science courses and C or better in the minor are accepted. A minimum of 36 hours or its equivalent in residence in full-time graduate study at West Virginia University is required.

With the approval of his adviser, a prospective candidate selects: (A) four major areas in the field of Political Science from the following six offered by the Department: (1) American National, State and Local Government; (2) Politics and Policy Development; (3) Public Administration; (4) Foreign and Comparative Government; (5) International Relations, Organizations, and Law; and (6) Political Theory; and (B) a minor area in a related field. At least one year prior to the conferring of the degree and after maintaining at least a 3.0 average in the major

field and a 2.0 average in the minor, a prospective candidate is formally admitted to candidacy for the Doctor's degree upon satisfactorily passing written and oral examinations in the four major areas and the minor. To be eligible for these examinations, the prospective candidate must have demonstrated competency in two languages other than English (normally French and German) through examinations conducted by the appropriate language departments.

Upon admission to candidacy for the Doctor of Philosophy degree, the candidate must select a topic for a dissertation under the direction of his adviser, complete a dissertation which makes a contribution to knowledge in the candidate's area of concentration, and pass a final examination based primarily upon the dissertation. After successful completion of this final examination, the candidate will be recommended for the degree.

200. Research Materials and Techniques in Political Science. I. 3 hr. A study of basic source materials in political science and of the techniques and methods of governmental research. Required of graduate majors.

210. American Political Institutions. I. 3 hr. PR: Pol. Sci. 2 or consent. Development of the Constitution, Congress, the Presidency, and the Supreme Court as institutions with special attention to current problems and issues.

211. Problems of American National Government. II. 3 hr. PR: Pol. Sci. 2 or consent. This course is intended to give recognition to the major contemporary problems of government. Extensive reading of background materials as well as current literature in the field.

213. American Constitutional Law. II. 3 hr. PR: Pol. Sci. 2 or consent. Basic principles of American constitutional law as developed through interpretation with special emphasis on constitutional theories and national development. Primarily for seniors and graduate students.

218. Government and Business. I. 3 hr. PR: Pol. Sci. 2 or consent. An examination of government regulations of the economy dealing with the origin and development of public policies, constitutional and political basis of regulation, relationships between political and economic institutions and processes, and an evaluation of the consequences of regulatory policies.

221. West Virginia Government and Administration. I, II. 3 hr. A study of the organization and operation of the state government of West Virginia.

225. Municipal Government. II. 3 hr. Legal basis, structure, operation, and problems of municipal government and municipal relations with other governmental units.

226. Problems for State and Local Government. I. 3 hr. An examination of current problems of state, county, and municipal governments. Students are expected to have completed Pol. Sci. 120 or its equivalent.

231. History of Political Parties. I. 3 hr. An examination of the growth of political parties in the United States. Analysis of issues in presidential campaigns as they relate to political party development. Offered in odd-numbered years.

232. Public Opinion and Propaganda. II. 3 hr. Analysis of techniques of sampling and measuring public opinion; detection of propaganda; the nature of propaganda and methods of the propagandist. Offered in alternate years.

233. Current Political Issues. I. 3 hr. An examination of political party platforms and the major issues of the political campaign. Students will be expected to examine background materials thoroughly. Offered in even-numbered years.

234. The Legislative Process. II. 3 hr. Structure and organization of legislative bodies. Powers of legislature. Detailed study of law-making procedures. The influence of outside forces. Offered in alternate years.

241. Administrative Organization and Management. II. 3 hr. PR: Pol. Sci. 140 or consent. Analysis of governmental administrative organization and reor-

ganization and of such management functions as leadership, planning, coordination, public relations, and management improvement. Offered in alternate years.

244. Administrative Law and Regulations. II. 3 hr. PR: Pol. Sci. 140 or consent. Study of the law of administration, primarily by the case method, covering administrative powers, procedure in administrative adjudication and rule-making, discretion, judicial control, and administrative liability. Offered in alternate years.

245. Public Administration and Policy Development. I. 3 hr. PR: Pol. Sci. 140 or consent. Analysis of decision-making and policy development in the administrative process by the case method. Offered in alternate years.

246. Comparative Public Administration. II. 3 hr. A survey of the theory and practice of public administration in diverse cultures and national political systems.

250. Comparative Government. I. 3 hr. A comparative study of modern political institutions with particular attention to European constitutional government and politics.

251. Modern Dictatorships. II. 3 hr. Politically undemocratic governments. Provides background of dictatorships generally, followed by treatment of several modern dictatorships.

252. British Government and Politics. II. 3 hr. Intensive study of British government with emphasis upon both internal and external policies, primarily during the twentieth century. Offered in alternate years.

253. The Commonwealth of Nations. II. 3 hr. An analysis of the political relationships between the members of the Commonwealth and a comparative study of the governments of the Dominions with particular reference to Canada and Australia.

254. Governments of Asia. I. 3 hr. A survey of contemporary politics and governments of Asia.

255. Governments of Latin America. II. 3 hr. A comparative study of the major nations of Latin America.

256. Governments of the Middle East. I. 3 hr. An examination of governments and political forces of the Middle East.

261. International Organization. II. 3 hr. Emphasis will be placed upon agencies created since the close of World War II. Some reference to development of international law and League of Nations.

262. Specialized Agencies of the United Nations. II. 3 hr. A detailed treatment of the specialized agencies and related institutions.

263. Public International Law. I. 3 hr. Law governing relations among nations, including development of rules, means of enforcement, and conflicts between theory and practice.

264. Conduct of American Foreign Relations. I. 3 hr. Basic concepts about and factors influencing the decision-making process and the conduct of United States foreign policy, with special attention to the problems of ends and means of a democracy, pressure interest groups (i.e., the military-industrial complex and the administrative bureaucracy); recent theories, analytical tools, and methodology in the problem areas of conflict-resolution, nonconsensus situations, and inter-nation influence; regional patterns, problems, and prospects of United States policy in Europe, Africa, Asia, the Middle East, and the Soviet bloc since 1945.

265. Basic Factors in Power Politics. II. 3 hr. PR: Pol. Sci. 2 or consent. Analysis of factors of power in the nation-state system. Evaluation of nationalism and concepts of national interest in modern world politics.

266. Soviet Foreign Policy. I. 3 hr. PR: Pol. Sci. 150 or 160 or consent. Basic concepts about and factors influencing choice in the formulation and execution of Soviet foreign policy; the development and present patterns in Soviet foreign relations with key states and the United Nations; possible problems and prospects in future Soviet relations.

272. Recent and Contemporary Political Thought. I. 3 hr. An examination of integral liberalism and the forces leading to the decline of liberalism and a critical analysis of the Fascist and Communist ideologies with their threat to the traditions of western civilization embodied in Christianity and conservatism.

273. American Political Theory. II. 3 hr. PR: Pol. Sci. 171 or consent. A survey of major political ideas and their influence upon American society and government from the seventeenth century to the present. Offered in alternate years.

274. Problems in Contemporary Political Thought. II. 3 hr. An intensive study of current trends in political thought through examination of the works of contemporary writers. Offered in alternate years.

300, 301. General Seminar in Political Science. I, II. 1 hr. each. Open to properly qualified students in conjunction with Directed Reading and Research Courses for the presentation of papers for critical consideration; some attention will be given to methodology and bibliography.

310, 311. Directed Reading and Research in American National Government. I, II. 1-15 hr. per sem., students may enroll more than once.

314. Seminar in American National Government. I. 3 hr. PR: Consent. Offered every fourth year.

320, 321. Directed Reading and Research in State Government. I, II. 1-15 hr. per sem., students may enroll more than once.

324. Seminar in State and Local Government. I. 3 hr. PR: Consent. Offered every fourth year.

325, 326. Directed Reading and Research in Local Government. I, II. 1-15 per sem., students may enroll more than once. PR: Pol. Sci. 225 or consent.

330, 331. Directed Reading and Research in Politics. I, II. 1-15 hr. per sem., students may enroll more than once. PR: Pol. Sci. 130 or consent.

334. Seminar in Politics and Policy Development. I. 3 hr. PR: Consent. Offered every fourth year.

344. Seminar in Public Administration. I. 3 hr. PR: Consent. Offered every fourth year.

346, 347. Directed Reading and Research in Public Administration, I, II. 1-15 hr. per sem., students may enroll more than once. PR: Pol. Sci. 140 or consent.

351, 352. Directed Reading and Research in Comparative Government. I, II. 1-15 hr. per sem., students may enroll more than once.

354. Seminar in Comparative Government. II. 3 hr. PR: Consent. Offered every third year.

361, 362. Directed Reading and Research in International Relations. I, II. 1-15 hr. per sem., students may enroll more than once.

364. Seminar in International Relations. II. 3 hr. PR: Consent. Offered every third year.

374. Seminar in Political Theory. II. 3 hr. PR: Consent. Offered every third year.

375, 376. Directed Reading and Research in Political Theory. I, II, 1-15 hr. per sem., students may enroll more than once.

380. Thesis. I, II. 2-15 hr.

PSYCHOLOGY

Admission. Acceptance of the student will be based on: (1) adequate academic aptitude at the graduate level as measured by the Graduate Record Examination; (2) a minimum average grade of 2.5 (C+); (3) personal qualities in the applicant which are predictive of success in graduate study and satisfactory professional placement after graduation; (4) adequate preparation in the biological and social sciences, experimental psychology, and statistics. By permission, deficiencies in preparation may be made up after admission to the department. Students are expected to maintain a 3.0 (B) average in their psychology courses during the first graduate year, and to present a final 3.0 average in all psychology courses attempted.

The M.A. Degree. The graduate program leading to the Master's degree prepares the student for doctoral study or for technical employment at the M.A. level. Competence in the basic "core" areas of psychology is stressed; however the student may specialize to a limited extent in the technology of clinical or industrial psychology. Facilities include a clinic where students may gain practical experience in the clinic team approach to behavior problems. Comprehensive written examinations in several basic areas of psychology must be passed within two years after admission to the department. A thesis reporting the results of experimental research must be presented. The final oral examination will cover the thesis and related areas.

The Ph.D. Degree. The doctoral programs aim to prepare a small number of well-qualified psychologists for two types of careers: (1) the teaching of general psychology and (2) clinical service in institutions, clinics, or schools. Both programs require at least 75 semester hours of work. The clinical program requires a 12-months internship in an approved setting. The career teacher program requires an academic year of supervised college teaching.

Students are admitted to doctoral study only after completion of the Master's degree or its equivalent and shall be subject to a screening examination to determine their readiness for doctoral work. After about 30 hours of work in residence beyond the M.A. degree the student will be admitted to a comprehensive preliminary examination in which he must demonstrate a reading knowledge of two foreign languages, competence in research design and applied statistics, and a knowledge of such core areas of psychology as may be required of all students.

Upon passing the qualifying examination, the student will be formally promoted to candidacy for the doctorate. He will then be assigned a doctoral committee which will direct his further course work and his dissertation research, and will approve his internship setting.

After completion of a satisfactory dissertation and all other requirements, the candidate will take a final examination, written, or oral, over his major and minor specialties and the dissertation.

201. Physiological Psychology. I. 3 hr. PR: Psych. 103, 104 and Zool. 271 or equiv. The organic basis for psychological activities such as perception, emotion, motivation, and learning.

205. Individual Differences. II. 2 hr. PR: One course in psychology. Nature and extent of the differences among individuals in psychological traits such as intelligence and personality, as influenced by heredity, schooling, age, sex, and culture. Primarily for students in psychology and education.

206. Learning and Motivation. I or II. 3 hr. PR: Psych. 103, 104 or equiv. Survey of experimental data in the area of learning and motivation. Special emphasis on contemporary learning theory.

214. Job Analysis. I or II. 3 hr. PR: Psych. 244 or I.E. 140. Instruction and supervised practice in preparation and use of job analyses. For students of psychology, engineering, management, or rehabilitation counseling.

216. Attitudes and Propaganda. II. 3 hr. PR: Psych. 1 or 3 or consent. Includes: the nature of attitudes and opinions, attitude measurement, opinion changing, propaganda use and analysis, the social psychology of mass media, demo-

cratic values and public opinion. Designed to meet the needs of students from a variety of fields as well as psychology—especially sociology, political science, and journalism.

218. Psychology of Personality. I or II. 3 hr. PR: Two courses in psychology, or consent. Critical consideration of major theories of personality, including Freudian, neo-Freudian, learning theory, and trait theory. The basis and logic of personality theorizing will be stressed.

222. Child Behavior. I. 3 hr. PR: Psych. 1 or 3. Growth trends in behavior through adolescence, including development in the physical, intellectual, emotional, social, and personality areas.

225. Group Psychometric Testing. I. 3 hr. PR: Psych. 1 or 3, and 130. Theory underlying the construction of group tests of intelligence, aptitudes, interests, personality, and attitudes. Practice in administering, scoring, and interpreting them.

226. Advanced Experimental Psychology. II. 3 hr. PR: Psych. 103, 104, 130. Lectures and laboratory. Design of psychological experiments; psychophysics of audition and vision.

229. Abnormal Psychology. I, II. 3 hr. PR: Psych. 1 or 3. A consideration of the major behavior disorders and the various psychological, surgical, chemical, and medical treatments thereof.

233. Exceptional Children. II. 3 hr. PR: Child or educational psychology. Study of children who present psychological problems because of: (1) exceptional mental retardation or advancement; (2) organic disabilities having behavior consequences, such as cerebral palsy or deafness; (3) disorders of conduct associated with atypical personality functioning. Of special interest to those who regularly deal with children as teachers, nurses, etc.

236. Psychology of Adjustment. I, II. 3 hr. PR: Psych. 1 or 3, or consent. Dynamic principles of human personality adjustment.

238. Introduction to Clinical Psychology. I or II. 3 hr. PR: Psych. 218, 236, or consent. The contribution of clinical psychology to understanding people. Foundation for advanced courses in clinical methods and skills. Of interest to advanced undergraduates and graduates in education, guidance, personnel, and social work as well as professionally-oriented students in psychology.

240. History of Psychology. II. 3 hr. PR: Psych. 1 or 3. Traces the development of the science and concepts of psychology from their origin in philosophy, physiology, and medicine up to the modern era.

242. Advanced Social Psychology. I. 3 hr. PR: Psych. 116 or consent. A consideration of contemporary theory and practice in social psychology.

244. Personnel Psychology. I. 3 hr. PR: Psych. 1, or 3 and 4, and a course in business, psychological, or engineering statistics. Application of psychological principles and techniques for selecting personnel, evaluating performance, analyzing jobs and workers.

245, 246. Seminar. I, II. 1-3 hr. Critical study of selected topics.

260. Statistical Methods in Psychology. I. 3 hr. PR: Psych. 130 or equiv. Sampling theory, probability, further parametric and non-parametric statistics.

270. Group Dynamics. (Same as Sociol. 270). I or II. 3 hr. PR: Introductory course in psychology or sociology, or permission. An interdepartmental course, combining psychological and sociological approaches, in which the dynamics of groups in operation are considered. The following subjects will be treated: leadership, informal communication and group pressures, the relation of group aims to group organization, and the effect of the group on personality. Attention is given to recent researches and to practical applications.

301, 302. Special Problems in Research. I, II. 1-3 hr. per sem.

303. Master's Thesis. I, II. 1-6 hr. per sem.

305, 306. Directed Study. I, II. 1-3 hr. Directed reading and research in special areas.

310. Projective Techniques. I. 3 hr. PR: Psych. 218, 229, 324, and consent. Administration, scoring, and interpretation of Rorschach and Thematic Apperception Test.

311. Advanced Projective Techniques. II. 3 hr. PR: Psych. 310 or equiv. Supervised practice in interpretation and report writing.

314. Practicum in Industrial Interviewing. I, II. 3 hr. PR: Psych. 244 or 115. Includes a survey of literature concerned with industrial interviewing, a review of personal history data found to be significant in industrial selection, and intensive study of interview techniques, practice and recorded interviews by the student with critiques by the instructor.

316. Counseling and Psychotherapy. I or II. 3 hr. PR: Psych. 218, 229, or equiv. Individual and group psychotherapy.

317. Practicum in Counseling and Psychotherapy. I. 1-3 hr. PR: Psych. 316 or equiv. Supervised experience in psychotherapeutic techniques used by the psychologist in a clinic setting.

322. Infancy and Childhood. II. 3 hr. PR: Psych. 218, 222, 229, Soc. 243, or equiv. A theoretical study of psychological growth. Comparative and cross-cultural research is emphasized.

324. Individual Intelligence Testing. I. 3 hr. PR: Psych. 122 and 225, or Educ. 375, or consent. Theory and practice in Binet, Wechsler, and other individual tests of cognitive functioning.

329. Behavor Pathology. I. 3 hr. PR: Psych. 218, 229, or consent. Advanced study of etiology and dynamics of severe behavior pathology. Recommended prior to or concurrent with Psych. 310.

338, 339. Clinical Psychology. I, II. 1-3 hr. PR: Psych. 324 and consent. Supervised practice in use of psychological techniques.

345, 346, 347, 348. Seminar. I, II. 1 or 2 hr. Critical study of selected topics.

353, 354. Teaching Practicum. I, II. 1-3 hr. PR: Consent. Supervised practice in college teaching of psychology.

360. Analysis of Variance. II. 3 hr. PR: Psych. 130, 260, or consent. A discussion of tests of homogeneity of variance, parametric and non-parametric analysis of variance, and analysis of covariance. Implications of these techniques for experimental design will be considered.

361. Correlation Analysis. I. 3 hr. PR: Psych. 130. A study of the correlational techniques used in research and development in psychology with practice in the application of the methods to typical problems. The methods studied will include product-moment, biserial, tetrachoric, partial, multiple, and others.

397. Research. I, II, S. 1-15 hr.

SOCIAL WORK

The professional curriculum in social work is on the graduate level and leads to the Master of Social Work degree. The program is accredited by the Council on Social Work Education.

The work toward this degree requires two years of academic residence, beginning in the fall semester of the academic year, and includes the summer session between the two regular academic years. Students may be admitted to the second year of the program after the satisfactory completion of one year of comparable social work education, if they meet the general requirements for admission to the graduate program.

The courses in method provide a concentration in social casework. Courses in other social work methods are given to provide the student with the knowledge required for beginning competence in the field of Social Work.

The curriculum is based on the conviction that there are common elements in all social work and that the student who receives the degree will be prepared to practice in almost any social work setting.

Field Work

The two-year graduate curriculum includes alternating periods of study on campus and field instruction in social agencies. Field instruction is required of all candidates for the master's degree; it is provided jointly by the University and selected cooperating agencies. The faculty of the Department of Social Work maintains close contact with each student and agency during the blocks of field instruction.

Field instruction is usually given in two agencies, with somewhat different programs. First year placements are for four months. Second year placements are six months in length, running continuously from early September through February of the student's second academic year.

Placements are made in agencies in West Virginia and nearby states in a wide range of social agencies, hospitals, clinics, and rehabilitation centers.

Scholarships and Educational Stipends

A number of scholarships, traineeships and educational stipends are available for graduate social work students, ranging in value from $150 to $2,500 per year. Inquiries concerning these should be made to the Chairman of the Admissions Committee, Department of Social Work.

Admission Requirements for the Professional Program

Students are admitted for graduate study in the Department of Social Work who meet all of the following requirements:

1. Graduation with a bachelor's degree from any accredited college or university.
2. Proof of superior academic capacity and achievement. (The Graduate Record Examination will be required of all those accepted for graduate training and may be required on any application as a prerequisite to the consideration of any application for admission.)
3. Evidence of undergraduate work in the humanities, physical and behavioral sciences sufficient to provide background for graduate study in the Department of Social Work. (Applicants need not have concentrated or majored in social work or the social sciences in their undergraduate studies, however.)
4. Approval by the Committee on Admissions of the Department, based on the above, and on satisfactory evidence of personal characteristics which give promise of success in the profession of social work.

Application for admission to the professional program of the Department of Social Work is made on forms which may be obtained from the Department. Prospective students are requested to make application as far in advance of the date they wish to enroll as possible.

Application for Admission to the Professional Program

Application for admission to the professional program of the Department of Social Work is made on forms which may be obtained from the Department. Prospective students are requested to make application as far in advance of the date they wish to enroll as possible.

Requirements for the Degree of Master of Social Work

The degree of Master of Social Work is conferred by the University upon those students who satisfactorily complete the requirements as established by the Graduate School. These requirements are:

1. Completion of graduate courses approved by the Department of Social Work totaling not fewer than 54 semester hours, of which the last 30 hours shall have been completed in West Virginia University.
2. Completion of a field work program approved by the Department of Social Work.
3. Demonstration of competence in the theory and practice of social work to the satisfaction of the faculty of the Department. This will include passing a comprehensive examination at the end of the first year of graduate work and proof of competence for professional practice before the end of the second year of study. The degree will *not* be awarded solely for credits earned.

Courses of Instruction

General Prerequisites: Twelve semester hours in the behavioral sciences are required for admission to social work courses in the 200 series. The 300 series courses are designed as an integrated program for students who are working toward the M.S.W. degree. Courses are open to other students by consent and as required in their curricula.

212. The Heritage of American Social Welfare. I. 3 hr. A general introduction to social welfare in the United States. History, philosophy, programs and problems. Social welfare as a social institution. The American way in welfare. The emphasis is on what the citizen needs to know about welfare problems and solutions.

213. An Introduction to Social Welfare Policy and Services. 3 hr. PR: S.W. 212. A critical analysis of theory and practice in major areas of welfare, including public assistance, the care of dependent children, mental health and service for the aged.

215. The Profession of Social Work. II. 3 hr. PR: S.W. 212 and S.W. 213. History and philosophy of social work as a professional service; its place in society; its purpose, underlying values, knowledge, and methods.

301. Social Casework I. I. 3 hr. Emphasis is placed on understanding the problems involved in asking for, using, and relinquishing help; on interviewing and recording; and on securing familiarity with services, policies and procedures of typical social agencies. Discussion is based on case records and readings in professional literature.

302. Social Casework II. II. 3 hr. Continuation of S.W. 301. Application of generic casework principles and concepts, drawing upon the student's field work experience and additional case materials from various settings.

303. Social Casework III. II. 3 hr. Analysis of case situations of increasing complexity involving deviate and normal behavior. Case materials drawn from medical, psychiatric, authoritative, child welfare and family service settings are used to develop the relationship of theory to practice in varied settings and the relationship of the caseworker to other disciplines.

305. Introduction to Social Group Work. II. 2 hr. Principles and methods used by social workers to help individuals use group relationships for individual growth and improved social functioning.

306. Social Welfare Policy and Services I. I. 2 hr. Study and appraisal of welfare policy and agency program public and voluntary. The student is expected to develop beginning skill in analyzing and assessing welfare policy, programs, problems, and professional role.

307. Social Welfare Policy and Services II. II. 2 hr. Continuation of Social Work 306.

308. Social Work Policy and Services III. II. 3 hr. More intensive critical assessment of social welfare policy and services, with special reference to selected current issues and value assumptions.

311, 312. Field Instruction. I, II, S. 5 hr. each. Field instruction and practice in selected agencies under general direction of the faculty and under direct supervision of an agency supervisor or faculty member.

314. Field Instruction. I, II. 1-4 hr. Field instruction and practice in a selected agency, under general direction of the faculty. Supplements S.W. 311 and 312.

317. Group Progress and Social Organization. II. 2 hr. Selected sociocultural concepts as related to social work practice. Consideration of role theory; small group theory; the family; social stratification; and social organization.

320. Growth and Behavior I. I. 4 hr. Man as a psychosocial, biological entity. Normal physical, psychological and social development. Theories of personality structure and dynamics. The mechanisms for maintaining social functioning under stress.

322. Growth and Behavior II. II. 3 hr. Further study of the process of personality growth. Application of psychodynamic principles to the study of emotional and mental illness. Consideration of the major organic and functional disorders.

323. Growth and Behavior III. II. 3 hr. An advanced course in the biological, psychological and social determinants of human behavior with emphasis on social functioning as the measure of adjustment.

331, 332. Advanced Field Instruction. I. 5 hr. each. Continuation of S.W. 311 and 312, usually in a different setting.

334. Advanced Field Instruction. I, II, S. 1-4 hr. Continuation of S.W. 311 and 312. Designed to supplement S.W. 331 and 332.

340. The Scientific Foundations of Social Work. I. 3 hr. Theoretical and empirical bases of social work practice. The scientific approach to social welfare problems. Introduction to research methods.

341. Problem Report. S, I, II. 1-2 hr. per sem. or term. Total required: 3 hr. Substantial exploration of a professionally significant problem.

360. Seminar. II. 3 hr. Intensive study in student's area of special interest. Individual conferences with staff; guided reading program; preparation of an individual written report. Seminar meetings for all students supplement individual study.

SOCIOLOGY

Candidates for the Master's Degree in Sociology must have an adequate undergraduate preparation in sociology or make up the deficit by taking courses which will not be credited toward the graduate degree. This latter may mean an additional semester or summer term of study. If not taken for undergraduate credit, Sociology 202, 243, 246 (or equivalents), and a course in statistics will as a rule be included in the master's program. A thesis is required of all candidates for the master's degree. Except where the student has a strong preparation in sociology, the thesis requirement is in addition to 30 hours of course work. The candidate must pass a final examination, which may be oral, written, or both, at the discretion of the Department. A part of this examination will test the candidate's general comprehension of the field of Sociology.

Recommended graduate minors are Economics, History, Political Science, Psychology, or Social Work.

Sociology 1 or equivalent, or Social Science 1, 2 is prerequisite for all courses in the 200 series.

202. Introduction to Social Research. I. 3 hr. Trends in social research; examination and methods and techniques.

205. Urban Sociology. II. 3 hr. Sociological analysis of institutional structure, social values, and individual goals in urban-industrial society; bureaucratization, collectivization, and mass culture; emphasis on political, economic, religious, and family institutions.

208. The Community. II. 3 hr. An analytical course intended chiefly to provide background data for students interested in programs of community action. Topics to be included are: the basic characteristics of communities; community institutions and resources; social cleavages within the community; and community survey and community planning.

210. Marriage and the Family. I, II. 3 hr. Sociological analysis of the contemporary family and its problems.

211. Sociology of Childhood. II. 3 hr. Adjustment of child to American culture.

220. Social Change. I. 3 hr. Sociological analysis of the major changes now going on in our society, of the forces underlying them, and of the tensions to which they give rise. Alternative future directions; rational manipulation and planning for social change.

224. Social Stratification. I. 3 hr. Description and analysis of various types of stratification systems, such as class and caste; social mobility, and status-striving. The course emphasizes the place of status, prestige, and power in the structure of American society.

229. Population and Migrations. I. 3 hr. Population theories; growth, composition, and distribution of American population; immigration and culture pluralism; internal migrations and their consequences.

231. Race Relations. I. 3 hr. Race relations in the U.S. with emphasis on the American Negro.

233. Criminology. II. 3 hr. Explanation of crime; critical study of criminal justice, penal methods, and reform movements.

234. Juvenile Delinquency. I. 3 hr. A scientific study of the nature, extent, and causes of delinquency in the United States. Methods of treatment, correction, and prevention, with emphasis on the work of the juvenile courts.

235. Collective Behavior. II. 3 hr. Analysis of new group formation and behavior following social dislocation, social unrest, crowd behavior, and other forms of social contagion; the public and public opinion; social movements.

243. Introduction to Anthropology. I. 3 hr. Biological history of man, analytical study of social organization, culture, and intellectual life of primitive man.

244. Culture and Personality. I. 3 hr. Significant interrelations between the individual and his culture.

246. Types of Sociological Theory. II. 3 hr. Examination of leading schools of sociological thought in our day.

248. Primitive Society. II. 3 hr. Description and analysis of several relatively simple societies; their family life, kinship systems, politics, economics, and religious practices.

250. Human Relations in Industry. II. 3 hr. The sociology of industrial relations. The factory or business firm as a social system. Formal and informal relations within the plant.

260. Complex Organizations. I. 3 hr. A sociological analysis of large-scale organizations, emphasizing their struture and functions. The course will examine the place in contemporary society of such organizations as the military, prisons, and hospitals.

265. The Sociology of Latin America. II. 3 hr. A systematic sociological consideration of the problems of the "underdeveloped" countries with special emphasis on Latin America: its culture, social structure, and national character. The main emphasis will be on social change.

270. Group Dynamics. (Same as Psych. 270). I. 3 hr. An interdepartmental course, combining psychological and sociological approaches, in which the dynamics of groups in operation are considered.

Prerequisites for all courses in the "300" series: Consent of department chairman.

371, 372. Thesis. I, II. 1-6 hr.

391. General Seminar. I, II. 3 hr.

392. General Seminar. I, II. 3 hr.

393. Seminar in Sociological Research. I, II. 3 hr.

394. Seminar in Sociological Research. I, II. 3 hr.

395. Seminar in Sociological Theory. I, II. 3 hr.

396. Seminar in Sociological Theory. I, II. 3 hr.

SPEECH

The Degree of Master of Arts

Persons who possess a Bachelor's degree from an accredited college or university may be admitted to the program. Any deficiencies in undergraduate preparation in upper division courses in speech or other fields in the Arts and Sciences appropriate to the anticipated area of specialization will be made up either without credit or (in instances of 200 or above numbered courses) added to the credit required for the degree.

1. Successful completion of the minimum number of required graduate hours as set forth in Program "A" or Program "B" below.
2. Completion, within the framework of the Graduate School and Departmental standards, of one of the two following programs of study:
   A. Concentration program which meets the following requirements:
      (1) Successful completion of at least a minimum of 30 semester hours of graduate credit, 24 of which may be in one speech field or in a combination of two speech fields, (chosen from public address, radio and television, speech correction and audiology).
      (2) A maximum of 6 semester hours of credit in Speech 399, Thesis, may be included in work toward the degree. Work submitted for credit in Speech 370, Research, and Speech 375, Independent Study, must not be part of the research done specifically for the thesis.
      (3) Successful passage of comprehensive written examination in the fields of study. Such examinations are administered toward the end of the student's course work and then only if and when the student has a "B" grade-point average or 75 per cent of his credit hours are of "B" grade or higher.
      (4) Submission for approval by the student's graduate committe of a thesis demonstrating original research and scholarly reporting.
      (5) Successful completion of an oral examination on the thesis.
   B. General program which meets the following requirements:
      (1) Thirty-six hours of speech or cognate courses with no fewer than 30 semester hours in Speech.
      (2) Successful passage of comprehensive examinations, both written and oral, in all areas of speech (interpretation, public address, radio and television, speech correction and audiology, and theatre). Either a 3.0 (B) grade-point average or 75 per cent of "B" grades for the hours carried is prerequisite to taking written comprehensive examinations.

The Degree of Master of Science

Persons who possess a Bachelor's degree from an accredited college or university may be admitted to a program leading to candidacy for the degree of Master of Science (in Speech Pathology and/or Audiology), provided that they, (1) present evidence of ability to pursue graduate work successfully, as measured by the Graduate School standards for admission, (2) provide evidence through written recommendations or successful professional experience, of the personal qualities pre-

dictive of professional success, and (3) show adequate academic preparation in the preprofessional courses in Speech Science and appropriate physical and social sciences. Any deficiencies in undergraduate preparation will be made up either without credit or added to the credit required for the degree.

Departmental requirements for the achievement of the Master of Science degree are as follows:

1. Completion of a minimum of 30 semester hours of approved graduate courses in Speech Science and Pathology, Audiology, Speech 301, and such others as may be required to attain professional competence.
2. Fulfillment of *one* of the two following alternatives:
   a. Submission of an approved thesis or problem report or
   b. Successful completion of an additional 6 semester hours of 300 level courses above the 30 semester hour minimum requirement.
3. Successful passage of oral and/or written final comprehensive examinations according to Graduate School and Departmental standards and procedures.
4. Demonstration of professional competence in clinical speech and/or hearing as measured by fulfillment of the academic and practical requirements required for existing certification standards.

The Degree of Doctor of Education in Speech Correction And/or Audiology

The degree of Doctor of Education is offered in cooperation with the College of Education. Admission to the Graduate School and enrollment in graduate courses do not themselves imply acceptance of the applicant for a Doctor of Education degree.

For College of Education prerequisites to admission, prerequisites to candidacy, and requirements for the degree see page 132. Departmental exceptions and additions to these general requirements are as follows:

In addition to the general College of Education prerequisites to admission, the applicant must satisfy a Department of Speech Faculty Committee in the following:

A. Possession of Basic Certification in the American Speech and Hearing Association, or its equivalent.
B. Normalcy of the applicant's speech and hearing.
C. Personal qualifications necessary to success in the field.

Curricular Requirements for Completion of the Degree. The exact amount and nature of course work to be undertaken by a candidate will be determined in the light of his previous preparation and the demands of his chosen field of application. The aggregate of courses of graduate study shall be not fewer than 75 semester hours, exclusive of the dissertation, of which a minimum of one-half of the semester hours in Education and a minimum of one-half of the semester hours in Speech Correction and/or Audiology and a minimum of one-half of the semester hours in Psychology shall be on the 300 level. Not more than 12 of the 75 hours may be earned in extension and/or practicum or field work. The program of course work shall include a minimum of 24 semester hours in Education, a minimum of 36 hours in Speech Correction and/or Audiology, and a minimum of 15 hours in Psychology. These courses shall be so ordered and distributed as to promote broad and systematic knowledge and the ability to prosecute independent research.

Candidates having an earlier graduate degree or its equivalent from West Virginia University will be required to complete a prescribed minimum of resident graduate work in one or more other institutions.

Time Limitation. Requirements for the Doctor of Education degree must be completed within seven years of admission to candidacy.

Basic Course Requirements: (Specialization in Speech Correction)

	*Hr. (Min.)**
From the Field of Education	24
From the Field of Speech Correction	36
Basic Areas	9-12 hr.
Specialized Professional Courses	21-24 hr.
Audiology Courses	6-9 hr.
Clinical Practicum	335 clock hours**
From Psychology	15
Total	75

Basic Course Requirements: (Specialization in Audiology)

From the Field of Education	24
From the Field of Audiology	36
Basic Areas	9-12 hr.
Specialized Professional Courses	21-24 hr.
Speech Correction Courses	6-9 hr.
Clinical Practicum	335 clock hours**
From Psychology	15
TOTAL	75

NOTE: For detailed selection of courses see following pages.

*Beyond the Baccalaureate degree. A maximum of 24 semester hours of credit achieved in fulfillment of the Master's degree may be counted toward these totals.

**Includes A.S.H.A. Basic Certification requirement of 200 clock hours, which will be deducted from the total if already accumulated by the candidate.

INTERPRETATION

200. ART OF STORYTELLING. I or II. 3 hr. PR: Consent. Principles involved in effective presentation of stories, with practical experience in classroom and before audiences. Stories of all types for adults and children studied.

203. PROFESSIONAL READING. I, II. 3 hr. PR: Speech 104 and consent. Intense training in interpretation. Designed to meet needs of individual. Full length public recital prepared and presented. Limited enrollment.

205. ADVANCED PROBLEMS IN INTERPRETATION. II. 3 hr. PR: Speech 29 and consent. Designed to deal with individual problems of advanced students in interpretation.

PUBLIC SPEAKING

220. SPEECH COMPOSITION. II. 3 hr. PR: Speech 11 and consent. Materials of speech, organization, and style; application to delivery.

221. PERSUASION. I. 3 hr. PR: Speech 11 and consent. Study and practice in identification of factors motivating human behavior and belief, how to secure and hold attention, the uses of suggestion, the dramatization of ideas. Application to advertising and writing as well as speaking. Adapted to needs of pre-law, commerce, and journalism students.

222. FORMS OF PUBLIC ADDRESS. II. 3 hr. PR: Consent. Composition and delivery of the oration, political speech, speech of introduction, dedicatory address, and eulogistic speech.

223. ADVANCED GROUP DISCUSSION. II. 3 hr. PR: Consent. Application of the principles and practices of group discussion to classroom teaching, the conference tables, committee work, policy-determining groups, and the public forum. Opportunities for participation by members of the class using current national and international problems.

225. INTERSCHOLASTIC FORENSICS. S. 3 hr. PR: Consent. Interscholastic public-speaking activities with emphasis upon types commonly termed original speech, such as debate, oratory, and extemporaneous speaking. Opportunity for performance in each type will be provided.

330. HISTORY OF RHETORIC. I. 3 hr. PR: Consent. Critical study of rhetoric from classical times to the present.

335. HISTORY OF AMERICAN PUBLIC ADDRESS. II. 3 hr. Consent. Critical study of leading American speakers, their biographies, speeches, and issues with which they dealt.

339. SEMINAR: PROBLEMS IN SPEECH. I, II. 3 hr.

RADIO AND TELEVISION

240. Radio and Television Dramatic Writing. II. 3 hr. PR: Speech 140 and 144 or consent. Dramatic script, documentaries, poetry programs, serial dramas, and children's shows for commercial and educational purposes. Scripts are written to be aimed at definite markets.

242. Radio Workshop. I. 3 hr. PR: Consent. Discussion of techniques of radio production. Laboratory experience in the production of University radio programs. Adapted to students interested in commercial and educational broadcasting.

243. Television Workshop. I. 3 hr. PR: Consent. Discussion of techniques of television production. Laboratory experience in the production of University television programs. Adapted to students interested in commercial and educational broadcasting.

244. Radio and Television Program Planning. II. 3 hr. PR: Speech 140 and consent. Analysis of the purpose and basic idea of a program in relation to audience composition. Requirements of effective structure. Practice in laying out program formats for all types of radio and television programming.

348. Seminar: Problems in Radio. II. 3 hr. PR: Consent.

349. Seminar: Problems in Television. I, II. 3 hr. PR: Consent.

NOTE: For additional courses of training for television, refer to Speech 6, Speech 162, Speech 260, Speech 261, Speech 263, Speech 264, and Speech 267.

SPEECH CORRECTION AND AUDIOLOGY

250. Survey of Oral Communication Disorders. I. 3 hr. PR: Consent. A survey of basic concepts and principles of the disorders of speech and their treatment. Primary attention is given to the more common speech deviations. Students observe examination and corrective methods of therapists in the clinic and schools. Normal speech and hearing development of children is considered. This is an orientation course for students majoring in speech as well as teachers, school administrators, psychologists, and rehabilitation workers.

252. Stuttering. I. 3 hr. PR: Speech 156. Theories and therapies of stuttering.

253. Profound Organic Speech Disorders. II. 3 hr. PR: Speech 251 or consent. Speech and language disorders related to cerebral injury. Emphasis on aphasia and aphasia therapeutics. Differential diagnosis of children with delayed speech and language.

271. Diagnostic Audiometrics. I. 3 hr. PR: Speech 157 and consent. A study of the various audiometric tests outlining the dimensions of hearing. Test administration and interpretation.

272. Hard of Hearing Therapy. II. 3 hr. PR: Speech 158 or consent. Bases and procedures of acoustic training and speech reading.

275. Speech Problems of Children. II. 3 hr. PR: Consent. Normal development of speech habits in children. Diagnostic and remedial procedures for speech defects. Relationship between speech and allied activities such as reading, spelling, and disciplinary problems.

276. Procedures and Methods in Clinical Speech and Hearing. I. 3 hr. PR: Speech 156, 157. Principles and methods of diagnosis and appraisal of disorders of communication. Methods of organization and administration of clinical speech and hearing programs in schools, hospitals, community clinics, and state and national services.

*277. Clinical Practice in Speech. I, II. 1-6 hr. PR: Consent. Supervised diagnosis and therapy of speech disorders. (May be taken for a maximum of 3 semester hours per semester of undergraduate or graduate credit.)

*278. Clinical Practice in Hearing. I, II. 1-6 hr. PR: Consent. Supervised diagnosis and therapy of hearing disorders. (May be taken for a maximum of 3 semester hours per semester of undergraduate credit.)

350. Experimental Phonetics. II. 3 hr. PR: Speech 153 and consent. Investigation of problems of phonetics as they are related to functional speech. Instruments used in sound analysis and an investigation of various aspects of architectural acoustics.

351. Problems in Speech Pathology. I. 3 hr. PR: Consent. The speech pathologist as a diagnostician and therapist in interdisciplinary investigations. Examination of counseling procedures, administrative practices in varied settings, and organization of programs for various pathologies of speech.

352. Advanced Speech Pathology. II. 3 hr. PR: Speech 251 and consent. Theories of causation and therapies for delayed language development, cleft palate, and cerebral palsy.

353. Neuropathologies of Speech and Language. I. 3 hr. PR: Speech 154, 253, or consent. Speech and language disturbances related to brain injury or maldevelopment. Consideration of the neurological bases, pathologies and psychological factors involved in the loss or lack of development or speech and language.

357. Seminar: Problems in Audiology. I. 3 hr. PR: Speech 158, 271. Topics vary from term to term to meet student needs. Emphasis will be on advanced concepts in audiological diagnosis, aural rehabilitation.

358. Acoustic Instrumentation. II. 3 hr. PR: Speech 158, 271. Principles of electronic design utilized in clinical auditory testing and amplification. Evaluation and assessment of hearing aids in aural rehabilitation.

359. Seminar: Speech Pathology. I. 3 hr. PR: Consent.

THEATER (*See Division of Drama, page* 121)

368. Seminar: Problems in Theatre. I, II. 3 hr. PR: Consent.

RELATED COURSES

270. Psychology of Speech. II. 3 hr. PR: 6 hr. of psychology and 18 hr. of speech. Psychological principles involved in speech situation. Analysis or roles of emotion, habit, learning judgment, rating, and imaginery in speech.

301. Research Problems and Methods. I. 3 hr. PR: Graduate standing. Required of all candidates for Master's degree in speech.

370. Research. I, II. 1-3 hr. PR: Speech 301, a speech seminar, and consent of chairman of department. For graduate students in speech.

375. Independent Study. I, II. 1-3 hr. PR: Speech 301, a speech seminar, and consent of chairman of department. Open to graduate students in speech who are pursuing independent problems in that field.

399. Thesis. I, II. 1-6 hr.

*Speech 277, and 278 meet the requirements of Education 128, which is necessary for certification.

COMMERCE

The College of Commerce offers two graduate programs. One leads to the degree of Master of Business Administration (M.B.A.). The other leads to the Master of Science degree with a major in either Economics or Business Administration.

Master of Business Administration (M.B.A.)

A candidate for the Master of Business Administration degree must have completed the following courses at an accredited undergraduate college or university:

Principles of Accounting (2 semesters)
Principles of Economics (2 semesters)
Principles of Marketing
Industrial Management
Business Finance
Business Statistics

A student without the necessary prerequisites may be admitted on probation subject to correction of these deficiencies at th beginning of the program. Deficiencies in undergraduate preparation must be removed without credit.

An undergraduate average of 2.5 (C+) or higher is required for admission to the program. In exceptional cases where the student has given an indication of ability to do graduate work, he may be admitted on probation even though his average is below 2.5. These probationary students will not be allowed to take the M.B.A. required courses during the first semester or summer session in residence, but may take graduate electives and courses to remove undergraduate deficiencies. Their records will be reviewd at the end of 12 hours of work to determine whether they should be admitted to candidacy, continued on probation, or suspended.

A program of courses will be planned by the candidate with his faculty adviser and is subject to the approval of his adviser. The M.B.A. degree requires a total of 36 hours of graduate credit. A grade-point average of at least 3.0 (B) is required on all courses taken as a graduate student at the University, including prescribed work completed to remove undergraduate deficiencies. A grade below "C" in any course taken while enrolled as a graduate student in the College of Commerce will result in suspension from the graduate program of the College.

The following courses are required for all candidates, exceptions requiring the approval of the M.B.A. committee:

First Semester

Accounting 301—Managerial Control
Management 301—Administrative Practices
Management 313—Production Administration
Marketing 313—Marketing Administration

Second Semester

Economics 301—Managerial Economics
Economics 302—Research and Reports
Finance 313—Financial Administration
Management 323—Administrative Policy

The candidate will also complete 12 semester hours of elective courses selected with the approval of his adviser. Of these electives, at least 3 hours must be in a graduate course of the College of Commerce at the 300 level. No thesis is required, but writing is emphasized in all courses.

The candidate must pass a comprehensive written examination covering the material in the required courses. This examination is normally taken during the semester in which the required courses will be completed and may be repeated only once.

Master of Science (M.S.)

A candidate for the Master of Science degree must have previously completed a minimum of 18 semester hours of upper-division courses in economics or business

administration at an accredited university or college. He must have satisfactorily completed a course in statistics and have a minimum grade-point average of 2.5 (C+) as an undergraduate. Additional courses prerequisite for the work the student expects to pursue may be required.

In exceptional cases students without the necessary prerequisite courses or with averages below 2.5 may be admitted on probation, subject to correction of deficiencies at the beginning of the program and demonstration of ability to do satisfactory graduate work. Deficiencies in undergraduate preparation must be removed without credit.

A program of courses will be planned by the candidate with his faculty adviser and is subject to the approval of his adviser. The M.S. degree requires 30 semester hours of graduate credit, including an acceptable thesis. No more than 6 semester hours of work may be taken outside the College of Commerce. A grade-point average of at least 3.0 (B) is required on all courses taken as a graduate student at the University, including prescribed work completed to remove undergraduate deficiencies. A grade below "C" in any course taken while enrolled as a graduate student in the College of Commerce will result in suspension from the graduate program of the College.

Candidates for the M.S. degree with a major in Economics should take the following courses if they have not already completed them:

Economics 211—Micro Economic Analysis
Economics 212—Macro Economic Analysis
Economics 220—Introduction to Quantitative Analysis
Economics 222—History of Economic Thought
Economics 241—Public Finance
Economics 302—Research and Reports
Economics 319—Seminar in Economics

Candidates for the M.S. degree with a major in Business Administration should complete at least 21 hours of 300 level courses, to be chosen subject to the approval of his adviser. Each candidate should include the following courses in his program courses if he has not already completed them:

Economics 211—Micro Economic Analysis *or*
Economics 301—Managerial Economics.
Economics 220—Introduction to Quantitative Analysis.
Economics 220—Introduction to Quantitative Analysis.
Economics 302—Research and Reports.
Management 225—Business Policy *or*
Management 323—Administrative Policy.
A graduate seminar in business administration.

ACCOUNTING

211. Accounting Systems. I. 3 hr. PR: Accounting 112. The adaption of accounting procedures to the demands of the firm, with emphasis on theoretical factors important to efficiency and internal control; system surveys and reports, the design of forms, office machine applications.

213 Income Tax Accounting. I. 3 hr. PR: Accounting 112 or consent. Tax theory and practice as developed from the regulations of the Internal Revenue Service; problems in preparation of tax returns for individuals, partnerships and corporations.

214. Income Tax Accounting. II. 3 hr. PR: Accounting 213. A continuation of Accounting 213.

216. Advanced Cost Accounting. II. 3 hr. PR: Accounting 115. Advanced work in the application of cost theory and procedures to cases and problems, which emphasize the managerial use of cost information.

217. Auditing Theory. I or II. 3 hr. PR: Accounting 112. Auditing fundamentals; objectives, standards and procedures; introduction to working-paper techniques; procedure statements of the American Institute of C.P.A.s.

218. Auditing Practice. I or II. 3 hr. PR: Accounting 217. Application of auditing theory and procedures, with emphasis on decisions which invoke judgment and are important in independent audits; audit working papers and reports; case studies.

224. Advanced Accounting Problems. I or II. 3 hr. PR: Minimum of 18 hours in accounting with an average grade of "B" or higher. Analysis and solution of representative C.P.A. problems.

230. Advanced Accounting Theory. I or II. 3 hr. Accounting 112, 115, and consent. A critical analysis of accounting concepts and standards with emphasis on their origin, development, and significance.

301. Managerial Control. I. 3 hr. PR: Accounting 2 and Economics 125. The use and significance of the quantitative techniques of accounting, statistics, and budgeting for planning, control, and decision making.

329. Seminar in Accounting. I or II. 3 hr.

395. Thesis in Accounting. I, II. 1-6 hr.

ECONOMICS*

205. Current Economic Problems. S. 3 hr. PR: Economics 1 and 2 or consent. For students in Education only. A course designed to acquaint public school teachers with reliable source material in economics and to instruct them in studying current economic problems.

210. Comparative Economic Systems. I or II. 3 hr. Structure and processes of existing economic systems throughout the world including review of basic principles of free enterprise, socialistic, communistic, and fascistic societies. Comprehensive analysis based on current and recent experiments in these economies.

211. Micro Economic Analysis. I. 3 hr. A study of price and output determination and resource allocation in the firm under various competitive conditions.

212. Macro Economic Analysis. II. 3 hr. An analysis of the forces which determine the level of income, employment, and output. Particular attention is given to consumer behavior, investment determination, and government fiscal policy.

217. Trade Unionism. I or II. 3 hr. PR: Economics 115 or consent. An analysis of the structure, government, attitudes, and policies of organized labor; the implications of union policy.

218. Collective Bargaining. I or II. 3 hr. PR: Economics 115 or consent. Theory and practice of collective bargaining; including contract issues, types of relationships, and the role of government policy.

219. Economics of Wages. I or II. 3 hr. PR: Economics 115 or consent. The determination of wage levels and structure; the functioning and organization of labor markets.

220. Introduction to Quantitative Analysis. I or II. 3 hr. PR: Economics 125. Study of the principal mathematical techniques employed in economic analysis; an introduction to econometrics.

222. History of Economic Thought. II. 3 hr. Economic ideas in perspective of historic development.

225. Transportation. I. 3 hr. Development of an inland transportation system and relations and policies of transport agencies.

*Economics 2 is a prerequisite to all upper-division courses.

230. Public Utilities. II. 3 hr. Development of regulation; economics of valuation and rate making.

235. Economic Growth and Fluctuations. I or II. 3 hr. PR: Economics 125 or consent. Industrial fluctuations; causes and possible remedies.

241. Public Finance. I or II. 3 hr. Governmental fiscal organizations and policy; taxes and tax systems with particular emphasis upon the Federal Government and the State of West Virginia.

245. Government and Business. I or II. 3 hr. Government in its role of adviser and umpire; analysis of governmental policies and practices affecting business.

250. International Economics. I or II. 3 hr. Development of trade among nations; theories of trade; policies, physical factors, trends, and barriers in international economics.

251. Economic Development. I or II. 3 hr. A comprehensive study of the problems, changes, and principal policy issues faced by non-industrialized countries in the process of economic development.

255. Regional Economics. I or II. 3 hr. An analysis of the factors that promote or deter the economic growth of a region, with emphasis on such matters as population shifts, economic base studies, industrial location analyses, input-output techniques, regional income estimation, local multiplier and cycle concepts, and the role of government in regional growth.

256. Advanced Statistics. II. 3 hr. PR: Economics 125 or equiv. An advanced approach to statistical analysis with emphasis on probability, inference, and multi-varied statistical techniques.

301. Managerial Economics. II. 3 hr. An analysis of markets and the problems of management in appraising business conditions and in adjusting to changes in product demand, costs, level of output, and profits.

302. Research and Reports. II. 3 hr. A study of sources of business information and research procedures, with application in the preparation of reports.

319. Seminar in Economics. II. 3 hr.

320. Quantitative Analysis. II. 3 hr. PR: Economics 220. Econometrics and an examination of mathematical models employed in economic analysis, such as linear programming, input-output analysis, game theory, and statistical decision making.

395. Thesis in Economics. I, II. 1-6 hr.

FINANCE

216. Risk Management. II. 3 hr. PR: Finance 115 or consent. A study of the transferable risks with which the entrepreneur must deal. Emphasis is on the process by which decisions are made for the handling of these risks, including an examination of the contributions and limitations of the insurance system.

313. Financial Administration. II. 3 hr. PR: Finance 111. A study of problems in business finance including those related to the financial structures of corporations and the working-capital and fixed-capital needs of a firm.

329. Seminar in Finance. I or II. 3 hr.

395. Thesis in Finance. I, II. 1-6 hr.

MANAGEMENT

213. Problems in Business Administration. I or II. 1-3 hr.

216. Personnel Management. I, II. 3 hr. Principles and practices in the direction, coordination, and remuneration of manpower.

225. Business Policy. I, II. 3 hr. PR: Senior standing and consent. Integrated study of policies, organization, facilities, and control techniques of business enterprises.

301. Administrative Practices. I. 3 hr. PR: Management 105 or consent. A study of interpersonal relationships through which administration becomes effective. Emphasis is on the human factors, but the influences of economic and technological factors are also considered. Focus is on the importance of harmony between individual needs and organizational goals.

313. Production Administration. I. 3 hr. PR: Management 111. The review and application of new analytical techniques to complex manufacturing problems.

323. Administrative Policy. II. 3 hr. PR: Consent. An integrated study of policies, organization, facilities, and control techniques of business enterprises.

329. Seminar in Management. I or II. 3 hr.

395. Thesis in Management. I, II. 1-6 hr.

MARKETING

210. Industrial Purchasing. I. 3 hr. PR: Marketing 111. A survey of corporate procurement problems facing modern purchasing executives.

215. Marketing Research. II. 3 hr. PR: Marketing 111. The utilization of present-day marketing research techniques in the solution of practical marketing problems, with particular reference to West Virginia.

313. Marketing Administration. I. 3 hr. PR: Marketing 111. The analysis of problems met by management in distributing goods and services efficiently to consumers.

329. Seminar in Marketing. I or II. 3 hr.

395. Thesis in Marketing. I, II. 1-6 hr.

CREATIVE ARTS CENTER

Division of Music

Prospective students in Music are required to have completed the prescribed four-year curriculum of undergraduate study in Music at West Virginia University or its equivalent at another institution of recognized standing, pass qualifying examinations in Theory, Music History, and auditions in Applied Music.[1] These examinations are given beginning three days prior to the dates of general University registration as listed in the University Calendar. All prospective graduate students must have taken these examinations before being allowed to register. Students will be required to make up any undergraduate deficiencies indicated by the results of these examinations.

The Degree of Master of Music

Candidates must establish an overall grade-point average of 3.0 (B) within a maximum of 36 hours. Applicants will be admitted to candidacy upon the completion of 12 semester hours of graduate study. No student will be admitted to candidacy until he has removed all undergraduate deficiencies and maintained a 3.0 (B) average in all graduate work completed.

Candidates for the Master of Music degree may major in one of six fields: Music Education, Applied Music, Theory, Composition, Church Music, History of Music.

[1]Graduates of the Division of Music will be admitted on their past record without these qualifying examinations, unless it is deemed necessary by the Dean of the Creative Arts Center. See Graduate Applied Music Requirements.

Graduate students majoring in Music Education will be allowed one of the following options, to be determined in consultation with their adviser:

1. Take 30 hours in approved courses, including 4 hours for thesis.
2. Take 30 hours in approved courses, and give a representative public recital in lieu of writing a thesis. Candidates selecting this option must be recommended by the proper music instructor and approved by the faculty. The recital carries 2 hours credit.
3. Take 36 hours in approved courses without thesis or recital. Six of the 36 hours may be in approved fields other than music.

A representative public recital is required of candidates majoring in Applied Music. Composition majors must submit as a thesis a composition in a large form.

All graduate students are required to participate at least two clock hours per week in a major performing group.

A general comprehensive oral examination must be passed by all candidates for the Master of Music degree. Candidates may repeat this examination after a three-month period. The results of the second oral examination will normally be considered final. The examining committee will decide immediately after an unsuccessful second attempt whether a petition for a third attempt will be permitted.

The following are the six curricula:

Music Education (with thesis)	*Hr.*
M. 310—Conducting	3
M. 340—Choral Techniques	2
M. 342—Instrumental Techniques	2
M. 344—Music Education	3
M. 346—Introduction to Research in Music Education	3
M. 399—Thesis	4
Music Literature and Theory (at least one course in each field)	6
Music Electives†	7
	30

Applied Music	*Hr.*
M. 300—Applied Music (Major instrument)	8
M. 326—Music Literature Survey	4
M. 327—Music Literature Survey	4
M. 398—Recital	4
Music Electives	10
	30

Composition	*Hr.*
M. 330—Intro. to Research	3
M. 360—Composition	6
M. 365—Counterpoint	2
M. 366—Counterpoint	2
M. 367—Style Survey	3
M. 370—Orchestration	3
M. 375—Pedagogy of Theory	3
M. 399—Thesis	4
Music Electives†	4
	30

*History of Music**	*Hr.*
M. 330—Introduction to Research in Musicology	3
M. 331—Seminar in Musicology	3
M. 367—Style Survey	3
M. 368—Style Survey	3
M. 399—Thesis, *or* M. 396—two lecture recitals	4
Two of the following courses:	6
M. 332—Music in the Middle Ages	
M. 333—Music in the Renaissance	
M. 336—Music in the Baroque Period	
M. 337—Music in the Classic and Romantic Periods	
Electives†	8
	30

Church Music (Voice Emphasis)	*Hr.*
M. 300—Voice	8
M. 300—Piano or Organ	2
M. 310—Conducting	3
M. 329—Survey Sacred Music	4
M. 340—Choral Techniques	2
M. 398—Recital *or* M. 399, Thesis	4
Music Electives (to include at least one course in theory)	7
	30

Church Music (Organ Emphasis)	*Hr.*
M. 300—Organ	8
M. 300—Voice	2
M. 310—Conducting	3
M. 329—Survey Sacred Music	4
M. 340—Choral Techniques	2
M. 398—Recital *or* M. 399, Thesis	4
Music Electives (to include at least one course in theory)	7
	30

Theory	*Hr.*
M. 330—Intro. to Research	3
M. 349—Psychology of Music	3
M. 365—Counterpoint	2
M. 366—Counterpoint	2
M. 367—Style Survey	3
M. 368—Style Survey	3
M. 370—Orchestration	3
M. 375—Pedagogy of Theory	3
M. 399—Thesis	4
Music Electives†	4
	30

*Candidates majoring in Music History must complete a minor field of 8 semester hours in some area of music or a cognate area. Prerequisite: 12 undergraduate hours in Music History and Literature (Music 140, 141, 280, 281, 282, 283, or equivalents.)

†To be eligible for graduation the candidates must demonstrate completion of grade level 8 on their major instrument.

The Degree of Doctor of Philosophy

Admission. Applicants to the program leading to the degree of Doctor of Philosophy must present necessary credentials for evaluation of previous training and experience to the Admissions Committee of the School of Music. This includes a transcript of all grades and must show proof that the applicant has had a minimum of 28 semester-hours in liberal arts studies. Prior to admission to the program the Committee may, at its discretion, require the applicant to take entrance tests in various fields of music, or the I.E.R. Intelligence Scale "C.A.V.D." test (or some similar test of mental ability), or it may require the applicant to present himself for a personal interview, or any of the three. Under normal circumstances the applicant must have attained an average grade of B in courses taken for his Master's degree. However, if sufficient professional experience should warrant, the Committee may waive the requirement of a B average or may grant an applicant conditional admittance subject to the satisfactory completion of certain specified courses or the attainment of a specified grade-point average within a semester's work.

Candidacy. Graduate students meeting the requirements of the Division of Music and the general requirements of the Graduate School will be recommended to the Dean of the Graduate School for admission to candidacy for the degree. These requirements are:

1. Demonstrate the ability to read German and French. (Upon the recommendation of the adviser and with the approval of the Dean of the Graduate School, one other language may be substituted for French or German).
2. Pass written examinations satisfactorily to show:
   a. Broad knowledge in "Theory" and "Music History and Literature."
   b. Knowledge in depth in the field of specialization.
3. Pass satisfactorily a comprehensive oral examination covering the entire field of music.
4. Present and have accepted an outline and prospectus of the dissertation.

Graduate students who have met these requirements and who have maintained an average of B in courses completed shall be admitted to candidacy. Should the applicant fail the written examinations he may apply to take them again after a minimum period of three months. Should the applicant fail the comprehensive oral examination he may be examined again after a minimum period of six months. The results of the second oral examination will be considered final. Admission to candidacy must precede the conferring of the degree by at least one year.

Fields of Specialization. Candidates shall select a program within one of the following fields of specialization: (1) Theory; (2) Composition; (3) Music Education; (4) Musicology. In addition, a minor field consisting of a minimum of 12 credit hours in another field of music or a cognate field will be required of all candidates, and will be chosen with the approval of the doctoral committee.

Curriculum. The exact amount and nature of course work to be undertaken by a candidate will be determined by the adviser with the approval of the doctoral com-

mittee in the light of the candidate's previous preparation and his field of specialization. The total of graduate courses shall be not less than 70 credit hours, exclusive of the doctoral dissertation. Of these 70 hours, a maximum of 24 credit hours will be applied from a master's degree or equivalent if of suitable character and quality.

Residence. In general, the requirements for the degree of Doctor of Philosophy contemplate at least three years of full-time graduate work. A minimum of 36 weeks is required in residence in full-time graduate study at West Virginia University beyond the master's degree or its equivalent.

Dissertation. The candidate must submit a dissertation pursued at West Virginia University under the direction of a major professor which demonstrates a high order of independent scholarship, originality, competence in research, and an original contribution to the field of specialization. If the candidate's field of specialization is Composition the dissertation will be an original, major (*i.e.*, full-length) composition such as a symphony, concerto, chamber opera, oratorio, symphonic poem, etc.

Final Examination. If the candidate's dissertation is approved and he has fulfilled all other requirements, he will be admitted to the final oral examination before his doctoral committee. At the option of his committee, a written examination may also be required. The final examination(s) shall be concerned with the dissertation, its contribution to knowledge, and the candidate's grasp of his field of specialization and its relation to other fields.

Time Limitation. Requirements for the degree of Doctor of Philosophy must be completed within seven years of admission to candidacy.

The Degree of Doctor of Musical Arts in Performance and Literature

Admission. Applicants to the program leading to the degree of Doctor of Musical Arts must present necessary credentials for evaluation of previous training and experience to the Doctoral Admissions Committee of the Division of Music. This includes copies of programs of recent major recitals, a transcript of all grades, and must show proof that the applicant has had a minimum of 28 semester hours in liberal arts studies. The applicant must also be approved for the program by an Audition Committee, by giving evidence of superior performance, artistic maturity, and extensive repertoire as specified under Graduate Applied Music Requirements in the *Announcements* of the Division of Music. The Audition Committee shall consist of the Director of the Division of Music, the Chairman of the Applied Music Department, and the major professors involved with the degree. To be admitted to the program the applicant must have attained an average grade of B in courses taken for his Master's degree.

Candidacy. Graduate students meeting the requirements of the School of Music and the general requirements of the Graduate School will be recommended to the Dean of the Graduate School for admission to candidacy for the degree. These requirements are:

1. Demonstrate the ability to read German and French. (Upon the recommendation of the adviser and with the approval of the Dean of the Graduate School, one other language may be substituted for French or German.)
2. Pass written examinations satisfactorily to show:
   a. Broad knowledge in Theory and Music History and Literature.
   b. Knowledge in depth in the literature of the field of specialization.
3. Pass satisfactorily a comprehensive oral examination covering the entire field of music.
4. Present a public recital.

Graduate students who have met these requirements and who have maintained an average of B in courses completed shall be admitted to candidacy. Should the applicant fail the written examinations he may apply to take them again after a minimum period of three months. Should the applicant fail the comprehensive oral examination he may be examined again after a minimum period of six months. The results of the second oral examination will be considered final. Admission to candidacy must precede the conferring of the degree by at least one year.

Fields of Specialization. The degree of Doctor of Musical Arts is offered in the area of Performance and Literature in the fields of specialization of (1) Piano, and (2) Voice.

Curriculum. The exact amount and nature of course work to be undertaken by a candidate will be determined by the adviser with the approval of the Doctoral Committee in the light of the candidate's previous preparation and his field of specialization. The total of graduate courses shall be no less than 70 credit hours, exclusive of the project of Advanced Study and recitals. Of these 70 hours, a maximum of 24 credit hours will be applied from a Master's degree or equivalent if of suitable character and quality.

Residence. In general, the requirements for the degree of Doctor of Musical Arts contemplate at least three years of full-time graduate work. A minimum of 36 weeks is required in residence in full-time graduate study at West Virginia University beyond the Master's degree or its equivalent.

Recitals. The candidate shall give two formal public recitals of at least one hour performing time each, the first of which shall serve as part of his admission to candidacy. The programs must include literature composed before 1800 as well as nineteenth and twentieth-century music. The candidate must also complete two of the following options:

1. A chamber music program
2. A major role in a vocal chamber work
3. A concerto with orchestra
4. A major role in an opera
5. A major role in an oratorio
6. A lecture recital

All programs and performances must be approved by the Doctoral Committee.

Project of Advanced Study. The candidate shall complete a Project of Advanced Study dealing with some topic related to his field of performance—such as some aspect of performance practice, pedagogy, instrumental development, a segment of the literature, etc.—to be presented in a scholarly written form for acceptance by his Doctoral Committee.

Final Examination. If the candidate's Project and recitals are approved and he has fulfilled all other requirements, he will be admitted to the final oral examination before his Doctoral Committee. At the option of his Committee, a written examination may also be required. The final examination(s) shall be concerned with the Project of Advanced Study and the candidate's grasp of his field of specialization and its relation to other fields.

Time Limitation. Requirements for the degree of Doctor of Musical Arts must be completed within seven years of admission to candidacy.

The Degree of Doctor of Education

The degree of Doctor of Education is offered in cooperation with the College of Education. The sequence of prerequisites to admission, prerequisites to candidacy, and requirements for the degree are set out in the Education section, page 132. The requirements for the degree of Doctor of Education for students in music are identical with those for students in education, except that, for students in music, a maximum of 24 semester hours of graduate work pursued in fulfillment of the requirements, for the Master's degree or its equivalent, if of suitable character and quality, may be credited toward the doctorate.

COURSES OF INSTRUCTION (MUSIC)

Applied Music

218. Methods and Pedagogy in Major Applied Fields. I. 1 hr. PR: Music 150.

219. Methods and Pedagogy in Major Applied Fields. II. 1 hr. PR: Music 218.

300. Applied Music. I, II. 1-4 hr. Open to qualified students in any field in Applied Music. Course number may be repeated as many times as necessary or desirable. A student must demonstrate ability of grade-level 4 on an instrument to receive credit in Music 300 on that instrument. Students other than music majors may take a maximum of one 30-minute lesson per week at one hour credit.

Section 28. I, II. Voice class for graduate students stressing fundamentals of voice production and pedagogy.

309. Master Class in Applied Repertoire. I, II. 2 hr. PR: Consent. A master class designed to give coverage through performance of the literature of a specific Applied Music field. Course may be repeated for credit; maximum credit 8 hours.

Conducting

310. Conducting. I. 3 hr. PR: Music 184 or equiv. A graduate course in instrumental and choral conducting. Major works are prepared and conducted through the use of recordings and the large University music organizations.

311. Conducting. II. 3 hr. PR: Music 310.

Literature

220. Repertoire. I. 1 hr.

221. Repertoire. II. 1 hr.

280. Survey of Operatic Music. II. 3 hr. PR: Music 141.

281. Survey of Symphonic Music. I. 3 hr. PR: Music 141.

282. Studies in Contemporary Music. I. 3 hr. PR: Music 141.

283. Survey of Chamber Music. II. 3 hr. PR: Music 141.

323. Keyboard Literature. S. 3 hr. PR: Music 220. An intensive study of the literature for keyboard instruments and the history of the literature.

324. Song Literature. S. 3 hr. PR: Music 220. An intensive study of the Art Song and the Lied and the history of their development.

325. Choral Literature. S. 3 hr. PR: Music 220. An intensive study of the body of choral music and the history of its development.

326. Music Literature Survey. I. 4 hr. PR: Music 140, 141. Intensive study of the history of music, music literature, musical documents, and the philosophies of music theory and aesthetics from Greek Antiquity up to 1750.

327. Music Literature Survey. II. 4 hr. PR: Music 140, 141. Continuation of Music 326, covering European music from 1750 to the present and music in America from Colonial times to the present.

330. Introduction to Research in Musicology. I. 3 hr. PR: Music 140-141 or equiv. A study of the field of musical research, with emphasis placed on the technic of research in music history.

331. Seminar in Musicology. II. 3 hr. PR: Music 330. Musical research and investigation. Special fields of study will be selected for each term and individual projects undertaken. Course may be repeated for credit.

332. Music in the Middle Ages. 3 hr. PR: Music 140-141 or equiv. and consent. A detailed study of the music and musical practice from the beginning of the Christian era to 1400.

333. Music in the Renaissance. 3 hr. PR: Music 140-141 or equiv. and consent. Continuation of Music 332 through the 16th century.

336. Music in the Baroque Period. 3 hr. PR: Music 140-141 or equiv. and consent. A detailed study of the music and musical practice of the period from 1600 to 1750.

337. Music in the Classic and Romantic Periods. 3 hr. PR: Music 140-141 or equiv. and consent. Continuation of Music 336 covering the period from 1750 to 1900.

338. History of Notation. S. 2 hr. PR: Music 140-141 or equiv. A detailed study in transcribing the musical manuscripts of the Middle Ages.

339. History of Notation. S. 2 hr. PR: Music 140-141 or equiv. Continuation of Music 338, covering the Renaissance Period.

Church Music

329. Survey of Sacred Music. 4 hr. PR: Music 140-141 or equiv. A study of music suitable to the liturgical year, including the historical background of the Jewish, Catholic, and Protestant Liturgies.

334. Choir Seminar. I, II. 2 hr. PR: Music 184 or equiv. Development of a choir for a period of two semesters, culminating in a performance of a program of sacred music. Course may be repeated for credit; maximum credit 4 hours.

Music Education

200. Band, Orchestra, Choral, Opera Theatre, and Music Education Clinics. 2 hr. Special problems of organization and development of the various performing organizations. Lecture, laboratory, and discussion groups.

201. Music in the Elementary School. I, II. 2 hr. PR: Music 10, 11, 12, or consent. Development of skills, procedures, techniques, and materials used by the general classroom teacher of music in grades 1-8. Not open to music majors. (Not offered in 1964-65).

246. Music in the Junior High School. I. 2 hr. PR: Music 181-182 or equiv. A consideration of the potentialities and special needs of the junior high school in music education; programs, procedures, and materials.

340. Choral Techniques. I. 2 hr. PR: Music 181-182 or equiv. A study of advanced techniques and procedures involved in the development of ensembles.

342. Instrumental Techniques. II. 2 hr. PR: Music 181-182 or equiv. A study of advanced techniques and procedures involved in individual performance and instruction through lecture-demonstrations by the applied music faculty.

344. Music Education. II. 3 hr. PR: Music 181-182 or equiv. Survey and critical study of the total music education program.

345. The Supervision of Music. I. 2 hr. PR: Music 181-182 or equiv. Problems in the supervision of music in the elementary grades and in junior high school.

346. Introduction to Research in Music Education. I. 3 hr. PR: Music 181-182 or equiv. Discussion and independent research problems in the general field of Music Education. Research report required.

347. Music Curriculum. I. 2 hr. PR: Consent. Philosophy, objectives, and organization of the school music curriculum. Primarily intended for doctoral students in Music Education.

348. Psychology of Music Learning. II. 3 hr. PR: Music 349 or consent. The application of learning theory to music learning; the nature of musical talent; music talent testing.

349. Psychology of Music. I. 3 hr. An introductory study of musical acoustics and of perceptions of music.

350. Psychology of Music Laboratory. II. 2 hr. PR: Music 349. A laboratory and research course designed to follow Music 349.

351. Music in Society. I. 2 hr. PR: Music 141 or consent. The function throughout history of music in society; the relation between social factors and musical practice.

352. Aesthetics of Music. II. 2 hr. PR: Music 141 or consent. An examination of the main classical and contemporary aesthetic theories and their applications to music.

Opera

210. Opera Theatre. I, II. 0-2 hr. Maximum credit 8 hr. PR: Music 20 or consent. Continuation of Music 20. Performance of major roles and advanced production techniques. Qualified students will undertake production-direction projects under supervision.

Theory and Composition

252. Analysis of Musical Form. I. 3 hr. PR: Music 4. A detailed study of the structure of music.

253. Counterpoint. I. 2 hr. PR: Music 4 or consent. Sixteenth century counterpoint.

254. Counterpoint. II. 2 hr. PR: Music 4. Eighteenth century counterpoint.

360. Composition. I, II. 3 hr. PR: Consent. A course primarily for candidates for the graduate degrees in Theory or Composition. Course may be repeated for credit; maximum credit 9 hours.

365. Counterpoint. I. 2 hr. PR: Music 253. Advanced 16th century counterpoint.

366. Counterpoint. II. 2 hr. PR: Music 254. Advanced 18th century counterpoint.

367. Style Survey. I. 3 hr. PR: Music 140, 141 or equiv. An analytical study of musical styles from Gregorian chant through the 16th century.

368. Style Survey. II. 3 hr. PR: Music 367. An analytical study of musical styles from the 17th century to the mid-19th century.

369. Research. I, II. 2 hr. PR: Music 329, 330, 346, or 367, and consent. Independent research projects in Theory, Music History, Music Education, or Church Music.

370. Orchestration. I, II. 3 hr. PR: Music 118 or equiv. Major projects of orchestration. Course may be repeated for credit; maximum credit 6 hours.

372. Band Arranging. II. 3 hr. PR: Music 118 or equiv. Major projects in arranging for the concert band.

375. Pedagogy of Theory. I. 3 hr. PR: Music 4 and consent. Consideration of the various approaches to the teaching of theory.

381. Style Survey. S. 3 hr. PR: Music 368. An analytical study of musical styles of the late 19th century and early 20th century.

382. Style Survey. S. 3 hr. PR: Music 381. An analytical study of 20th century music with emphasis on serial techniques and contemporary trends.

383. Remedial Theory. I, II. 0 hr. A course for graduate students who are deficient in undergraduate theory requirements.

Thesis or Recital

394. Doctoral Seminar. I, II. 4 hr. PR: Consent. Intensive individual investigation and preparation of research papers or compositions. Course may be repeated for credit; maximum credit 8 hours. Presented by the combined doctoral staff in music.

395. Dissertational Guidance. I, II. 1-12 hr. Credit not to be applied toward the 70-hour minimum for the Ph.D. or Ed.D.

396. Two Lecture Recitals. 1-4 hr. For History of Music majors only.

397. Recital. 2 hr. For Music Education majors only.

398. Recital. 1-4 hr. PR: Music 199 or equiv.

399. Thesis. 1-4 hr.

Division of Art

Candidates for the Degree of Master of Arts in Art must have an undergraduate major or minor in Art, a teaching field in Art, or the equivalent. Before being admitted to candidacy for the degree the student will take a comprehensive examination in the field and a test designed to demonstrate his ability to do graduate work, and any deficiency in preparation must be made up without graduate credit.

Divisional requirements for the degree are as follows:

1. Completion of a minimum of 30 semester hours of graduate work, including not more than 6 hours in thesis or problem.
2. Passage of a written comprehensive examination.
3. Completion of Art 290, Study of Original Works of Art (6 hours).
4. Passage of an oral examination on the thesis or problem.

Of the 30 hours, not more than 9 may be in studio courses.

With the consent of his committee, the student may elect a maximum of 6 hours in a related subject.

ART

211. Figure Drawing. I, II, S. 3 hr. PR: Art 11 or 111, 12 or 112, and/or consent. Study of the construction of the figure. Drawing from the draped and partially draped model.

213. Painting. I, S. 3 hr. PR: Art 113, 117 and consent. First semester advanced watercolor.

214. Painting. I, II, S. 3 hr. PR: Art 213 and consent. Second semester advanced watercolor.

216. Painting. II, S. 3 hr. Art 114, 118, and consent. First semester advanced oil painting.

217. Painting. I, II, S. 3 hr. PR: Art 216 and consent. Second semester advanced oil painting.

220. Art and the Schools. I, II, S. 2 hr. PR: 4 hr. of Art, including a minimum of 2 hr. studio.

221. Administration and Supervision of Art. I, II, S. 2 hr. PR: Art 220. Mainly for administrators and school principals who wish to become informed about all programs and the philosophies underlying them.

225. Secondary School Art. I or II, S. 3 hr. PR: Art 11 or 111, 12 or 112, 121, 122, 113, 114, and consent. Information and working skills desirable for the teaching of art on the secondary school level.

241. Medieval Architecture. I, II, S. 3 hr. PR: Art 105, 106. A study of architecture from the time of Constantine to the Renaissance.

250. Renaissance Painting. I, II, S. 3 hr. PR: Art 105, 106. A study of painting in Italy from Cimebue to Tiepolo; the Renaissance in Western Europe; a brief consideration of baroque and rococo painting as outgrowth of the Renaissance. Offered 1966-67 and alternate years.

260. Modern Painting. II, S. 3 hr. PR: Art 105, 106. Development in painting from the French Revolution to the present day.

271. American Architecture. I, II, S. 3 hr. PR: Art 105, 106. Developments in architecture in North America from Pre-Columbian times to the present day. Emphasis will be placed on the architecture of the United States.

275. Latin American Art. I, II, S. 3 hr. PR: Consent of the instructor. Art from Pre-Columbian times to the present. Outstanding examples of the various periods will be considered.

290. Study of Original Works of Art. S. 6 hr. PR: Art 105, 106, and consent of the Department. Directed study of the museums and libraries of some urban center such as Washington or New York; a study of the architectural developments of the locality.

350, 351. Special Topics. I, II, S. 1-3 hr. per sem. PR: Consent of the Department. Individual study to be determined by the student's requirements.

391, 392. Thesis. I, II, S. 3 hr. per sem. PR: Approval of Student's Committee.

Division of Drama

The Degree of Master of Arts

An option for a major in Drama may be pursued in the Department of Speech, College of Arts and Sciences.

See page 103 for program requirements.

DRAMA

202. Scene Design. II. 3 hr. PR: Drama 100 or consent. Lecture and laboratory in theories of scene design for stage and television, including actual construction of designs. Open to juniors, seniors, and graduate students.

203. Advanced Scenery and Lighting. I, II. 3 hr. PR: Drama 100 or consent. A more technical study of scenery and lighting problems than is offered in Drama 100. Students are given opportunity for study through independent investigation and research.

240. Summer Theater Production. S. 1-9 hr. PR: Consent. The study of summer productions, promotion and theatre management. Students will participate in all phases of summer theatre in a professional atmosphere.

250. Advanced Problems in Interpretation. II. 3 hr. PR: Drama 50 and consent. Designed to deal with individual problems of advanced students in interpretation.

251. Professional Reading. I, II. 3 hr. PR: Consent. Intensive training in interpretation. Designed to meet needs of individual. Full length public recital prepared and presented. Limited enrollment.

252. Art of Storytelling. S. 3 hr. PR: Consent. Principles involved in effective presentation of stories, with practical experience in classroom and before audiences. Stories of all types for adults and children studied.

260. Theatre Performance and Rehearsal Laboratory. I, II. 1 to 6 hr. PR: Drama 161 or consent. Participation in assigned theatre projects. Appreciation of creativity and performance techniques in theatre.

275. Advanced Acting. II. 3 hr. PR: Drama 75 and consent. Characterization, script analysis, style, theories, and techniques. Designed to meet needs of individual student.

280. Advanced Play Directing. II. 3 hr. PR: Drama 180, or consent. Emphasis on work of directing as an integrating artist. Display of high level of proficiency in direction of a one-act play required of all students enrolled.

281. Theatrical Dialects. I. 3 hr. PR: Consent. Study and mastery of 15 common dialects used in theater and radio.

282. Creative Dramatics. I. 3 hr. PR: Drama 75 or consent. The study and practice of creative dramatic activity as a method of learning and self development for children.

283. Playwriting. II. 3 hr. PR: Consent. Development of creative ability in dramatic composition. Study of techniques and problems of playwriting. Of cultural value, but primarily a writing course.

285. History of Theater. I. 3 hr. Historical survey of theater from primitive time to present. Includes both oriental and occidental theaters.

286. Drama Criticism and Aesthetics. I, II. 3 hr. A survey of chief critical and aesthetic theories of drama-ancient, modern contemporary.

EDUCATION

The College of Education is comprised of resident courses of instruction and facilities for research; University High School with its opportunities for observing, student teaching, directed supervision, and experimentation; and cooperating elementary and secondary schools for supervised student-teaching experience.

The College of Education is "accredited by the National Council for Accreditation of Teacher Education for the preparation of elementary teachers, secondary teachers, school service personnel, and school administrators, with the Doctor's degree as the highest degree approved."

MASTER OF ARTS

REQUIREMENTS FOR ADMISSION TO GRADUATE WORK IN EDUCATION

It is the responsibility of all applicants for admission to the Graduate School and all candidates for graduate degrees, certificates, and other such recognitions to conform to the general regulations of the Graduate School.

REQUIREMENTS FOR ADMISSION TO CANDIDACY FOR THE MASTER'S DEGREE IN EDUCATION

Graduate students apply to the College of Education *Committee on Admissions* for admission to candidacy for the Master's Degree in Education. Applicants who have undergraduate averages the equivalent of 2.5 or better may be admitted to candidacy when they have met the following requirements:

1. A first-class teaching certificate or at least 20 semester hours of approved undergraduate credit in Education.
2. A maximum of 14 semester hours of graduate credit completed prior to admission to candidacy. At least 6 of these hours must be in Education and must have been taken in residence of West Virginia University. *Students can take no more than 8 hours in extension prior to their completion of 6 hours in residence at the University.*
3. A satisfactory score on preliminary examinations in general ability, written English, and such other areas as the *Committee on Admissions* may prescribe.
4. Students admitted after September 1, 1962, must submit scores in the general aptitude test of the Graduate Record Examination.
5. A candidate for an administrative program must secure written approval from the adviser in order to be admitted to the program.

The *Committee on Admissions,* appointed by the Dean of the College of Education, will consider individually those applicants for admission to candidacy who do not meet these criteria.

A candidate conditionally admitted, who, upon the completion of a maximum of 15 semester hours of graduate work in residence, has not achieved a grade-point average of 2.5, shall be reclassified as a special graduate student, not eligible to be awarded a Master's Degree in Education.

OPTIONAL ROUTES TOWARDS A MASTER'S DEGREE IN EDUCATION

A. Thirty semester hours, including 6 semester hours of research (Education 361, Thesis). Examination (oral, written, or both, at the discretion of the candidate's advisory committee.)

B. Thirty semester hours, including 3 semester hours of research (Education 360, Problem), selected in conference with the candidate's committee, directed by th adviser, with final approval by the committee and 27 semester hours of course work. Examination (oral, written, or both, at the discretion of the candidate's advisory committee.)

C. Thirty-six semester hours, including 15 semester hours of course work. Examination (oral, written, or both, at the discretion of the candidate's advisory committee.)

D. Program options D and E are offered in several programs.

SPECIAL REQUIREMENTS FOR THE MASTER'S DEGREE IN EDUCATION

1. No student may be awarded a Master's degree in Education unless the student has a minimum grade-point average of "C" (2.0) on all work taken for graduate credit. (A grade of less than "C" does not carry credit toward a graduate degree, but will be counted in determining the grade-point average.)
2. No student will be permitted to repeat a required graduate course more than once.
3. Fifteen semester hours of approved courses in extension may apply toward the completion of degree requirements, if no work is transferred from another institution.
4. The maximum number of hours which may be used from extension courses is nine, if six semester hours of approved transfer credit from another institution is used toward the degree.
5. Students are limited to earning 8 hours in any one field in extension. A maximum of 12 hours of approved extension courses may be used for certification.
6. Requirements for the Master's Degree in Education must be completed within a period of seven years.

NOTE: All persons working toward administrative certificates in Education or who wish to add additional administrative certification shall be required to pass the screening examination required of all candidates for the Master's degree in Education.

NOTE: A candidate who fails the final Master's degree examination may, upon written consent of his advisory committee, be given a second examination not earlier than the following term or semester. A candidate who fails the second examination may, upon written request and with the unanimous consent of his committee, be given a third and final trial no earlier than one calendar year from the date of his second examination.

Graduate Advisers

The Dean of the College assigns graduate students to advisers on the basis of interest as follows:

Audio-Visual Education: Mr. Huffman
College Teaching: Mr. Hofstetter, Mr. Bell, and Mr. Cook
Elementary Principals: Mr. Bell
Elementary Curriculum Instruction: Mrs. Cunningham, Mr. Katz, and Mr. McAvoy
Guidance and Counseling: Mr. Jarecke, Mr. Wagner
General Administration (Superintendents): Mr. Hofstetter, Mr. Harrah
Home Economics Education: Miss S. A. Brown
Industrial Arts: Mr. Brennan
Reading and Language Arts: Mr. Kennedy
Secondary Curriculum and Instruction: Mr. Cook, Mr. Bailey, and Mr. Gautier
Secondary Principals: Mr. Miller, Mr. Gautier (NCATE)
Specials: Mrs. Booth, Elementary; Mr. Bailey, Secondary
Supervision: Mr. Harrah
Special Education: Mr. Neff
Teacher-Librarians: Mr. Bailey

Graduate Professional Curricula

Graduate Professional Education Curricula are offered in three major areas:

I. *Administration*
- Superintendents
- High School Principals
- Elementary School Principals

II. *Curriculum and Instruction*
- Supervisors of Instruction
- Secondary-School Classroom Teachers
- Industrial Arts Teachers
- Audio-Visual Education
- Home Economics Education
- Junior High-School Classroom Teachers
- Elementary-School Classroom Teachers
- Teacher Librarians
- Classroom Teachers in Special Education

III. *School Services*
- Counselors

The administrative certificates issued by the State Department of Education for superintendents, principals (elementary and secondary), supervisors, and counselors are called Professional Administrative Certificates.

CURRICULUM FOR SUPERINTENDENTS†

Degree: Master of Arts

I. *Required Courses* Program	A	B	C
Ed. 271	3	3	3
Ed. 301	3	3	3
Ed. 331	3	3	3
Ed. 335 or 336	3	3	3
Ed. 339	3	3	3
Ed. 340	0	3	3
Ed. 342	3	3	3
Ed. 346	3	3	3
Ed. 353 or 356	3	3	3
Ed. 360	0	3	0
Ed. 361	6	0	0
TOTAL	30	30	27
II. *Approved Electives*			
Ed. 270, 284, 306, 307, 308, 309, 326, 327, 340, 341, 343, 344, 345, 350, 367, 370 and/or academic courses approved by the adviser. (Academic deficiencies will have first consideration.)	0	0	9
TOTAL FOR MASTER'S DEGREE	30	30	36

Program A—Thesis required
Program B—Research Problem required
Program C—36 semester hour program

†A minimum of 5 years experience and a health certificate are required.

NOTE: For those who already hold a Master's degree and who wish to qualify for the University's recommendation for a Superintendent's Certificate, the following courses will satisfy:

Required Courses	19 Hr.
General Administration: Ed. 339, 340, 342, or 343 or 344	6-9 Hr.
Elementary-school Administration: Ed. 335*, 356	3-6 Hr.
Secondary-school Administration: Ed. 336*, 346, 353	3-6 Hr.
Introduction to Educational Research: Ed. 301	3 Hr.

*Ed. 335 or 336 (not both) can be accepted.

CURRICULUM FOR HIGH SCHOOL PRINCIPALS

Degree: Master of Arts

		Options			
I. *Required Courses:*	Program[1]	A	B	C	D
Ed. 271		3	3	3	3
Ed. 301		3	3	3	3
Ed. 327		3	3	3	3
Ed. 328		0	0	0	2
Ed. 336 or 346		3	3	3	3
Ed. 338		0	0	0	2
Ed. 339		3	3	3	3
Ed. 353		3	3	3	3
Ed. 360		0	3	0	0
Ed. 361		6	0	0	0
TOTAL		24	21	18	22
II. *Approved Education Electives*[2]					
Ed. 259, 270, 284, 285, 322, 331, 341, 348, 349, 371, 373, 385		6	6	6	5
III. *Approved Academic Courses*[3]		0	3	12	9
TOTAL HOURS FOR MASTER'S DEGREE		30	30	36	36

[1]A—Thesis required
B—Research problem required
C—36 semester hour program
D—Fulfills NCATE requirements

[2]Appropriate graduate courses related to the high school principalship may be submitted in the approved elective area with the adviser's consent.

[3]Academic courses approved by the adviser should be selected in two or more high-school teaching fields.

General requirements for the West Virginia High School Principal's Certificate are: (1) Graduation from an accredited college or university and qualifications for a Professional Certificate, valid in Grades 7-12; (2) three years of secondary-school teaching experience in Grades 7-12 (not in a one-room school); (3) a health certificate; and (4) acceptable score on the Master's screening examination.

Each of the options meets the qualifications for a West Virginia High School Principal's Certificate. Option D meets the qualifications needed for NCATE certification.

Those already holding a Master's degree who desire to qualify for this certificate, will be required to have the courses listed in Sections I and II.

CURRICULUM FOR ELEMENTARY SCHOOL PRINCIPALS[1]

Degree: Master of Arts

I. *Required Courses*	Options* A[2]	B[2]	C[2]	D[3]
Ed. 301	3	3	3	3
Ed. 306 or 307	3	3	3	3
Ed. 308 or 309	3	3	3	3
Ed. 315	0	0	0	2
Ed. 325	0	0	0	2
Ed. 326	0	0	0	2
Ed. 331 or 335	3	3	3	3
Ed. 339	3	3	3	3
Ed. 346	3	3	3	3
Ed. 356	3	3	3	3
Ed. 360	0	3	0	0
Ed. 361	6	0	0	0
TOTAL	27	24	21	27
II. *Approved Education Electives*				
Ed. 202, 221, 223, 259, 270, 271, 275, 284, 304, 305, 306, 307, 308, 309, 313, 315, 325, 326, 331, 335, 344, 348, 349, 366, 370, 372, 380, 385	3	6	5	0
III. *Academic Courses Approved by Adviser*	0	0	10	9
TOTAL HOURS FOR MASTER'S DEGREE	30	30	36	36

*A—Thesis required
B—Educational Research Problem required
C—36 semester hour program
D—Fulfills NCATE requirements

[1]General requirements for the elementary-school principal's certificate are: (1) acceptable score on the Master's screening examination; (2) graduation from an accredited college or university and qualifications for Professional Certificate, valid Grades 1-9; (3) three years of elementary-school teaching experience in Grades 1-8; and (4) a health certificate. Since most of the courses in this curriculum have prerequisites, the consent of the adviser and the instructors must be obtained prior to enrollment.

[2]Completion of programs under this option meets requirements for the elementary-school principal's certificate, but does **not** meet NCATE requirements.

[3]Completion of program under this option fulfills requirements for NCATE certificate. Approval of adviser must be obtained before this program can be pursued.

CURRICULUM FOR SUPERVISORS OF INSTRUCTION†

Degree: Master of Arts

		NCATE			Non-NCATE		
I. *Required Courses*	Program	A	B	C	A[1]	B[1]	C[1]
Ed. 271		3	3	3	3	3	3
Ed. 301		3	3	3	3	3	3
Ed. 331			3	3	3	3	3
Ed. 339				3			3
Ed. 346		3	3	3	3	3	3
Ed. 360			3			3	
Ed. 361		6			6		
II. *NCATE Required Field Courses*							
Ed. 380		2	2	2			
Ed. 381		2	2	2			
Ed. 382		2	2	2			
Ed. 383		2	2	2			

†A minimum of 3 years teaching experience and a health certificate are required.

III. *NCATE Required Courses for Problems in Teaching*						
Ed. 306 or 367	3	3	3			
Ed. 309 or 366	3	3	3			
IV. *Non-NCATE Required Courses for Problems in Teaching (General or Special)*						
Ed. 306 or 367				3	3	3
Ed. 307				3	3	3
Ed. 308				3	3	3
Ed. 309 or 366				3	3	3
	29	29	29	30	27	27
Approved Electives						
Ed. 259, 270, 331, 339, 348, and/or other courses approved by the adviser	2	2	7		3	9
Required Hours for Master's Degree	30	30	36	30	30	36

A and A[1]—Thesis required
B and B[1]—Research problem required
C and C[1]—36 semester hour program
NCATE Program meets requirements for certification in West Virginia.
Non-NCATE Program does not meet the requirements for certification in West Virginia.

CURRICULUM FOR COUNSELORS

Degree: Master of Arts

I. *Required Courses* Program[1]	A	B	C	D
Ed. 301	3	3	3	0
Ed. 373*	3	3	3	3
Ed. 374*	2	2	2	2
Ed. 375*	3	3	3	3
Ed. 376*	3	3	3	3
Ed. 377	3	3	3	0
Ed. 378*	2	2	2	2
Ed. 360	0	3	0	0
Ed. 361	6	0	0	0
Total	25	22	19	13
II. *Approved Electives*	5	8	17	23
Ed. 270, 271, 301, 309, 324, 360, 361, 368, 369, 371, 372.				
Psych. 205, 206, 218, 229, 233, 236, 238, 310, 311, 324, 350, 351.				
Soc. 210, 211, 233, 234, 244.				
Speech 275.				
Total for Master's Degree	30	30	36	36

Completion of this curriculum fulfills the scholastic requirements in West Virginia for a Counselor's Certificate. Other requirements are: (1) a Professional Certificate at the level at which the counseling is to be done; (2) 2 years of successful teaching experience at the level at which the counseling is to be done; and (3) a health certificate.

[1]A—Thesis required
B—Research problem required
C—36 semester hour program for counselors
D—36 semester hour program for teacher-counselors

*Completion of 13 semester hours as indicated by starred courses will contribute to endorsement as a teacher-counselor. For endorsement as a teacher-counselor it is necessary to hold a Professional Certificate.

If a Master's degree has been earned in some other field, certification as a Counselor may be procured by having 25 semester hours' credit, 19 in the required list and six from the electives.

CURRICULUM FOR SECONDARY-SCHOOL CLASSROOM TEACHERS†

Degree: Master of Arts

I. *Graduate Courses in Education* . . . . . 12-18 Hr.
Required Courses in Education . . . . . 6 Hr.

Programs:[1]	A	B	C	D
Ed. 336	3	3	3	3
Ed. 331 or 373	3	3	3	3
Ed. 271	3	3	0	0
Ed. 301	3	3	0	0
Ed. 360	0	3	0	0
Ed. 361	6	0	0	0
Ed. 397	0	0	0	3
TOTAL	18	15	6	9

II. *Approved Electives in Education* . . . . . 6 Hr. (Min.)
Ed. 221, 251, 259, 262, 270, 271, 274, 275, 284, 285, 301, 304, 305, 309, 322, 331, 337, 338*, 339, 346, 348, 360, 361, 364, 366, 367, 370, 371, 373, 375, 380*, 385, 395, 396, 397, 398.

III. *Graduate Courses in one of the candidate's certified fields.* 12-18 Hr.

IV.** *Graduate Courses in another of the candidate's teaching fields.* . . . . . 6 Hr. (Min.)

V. *Free electives (non-Education)* . . . . . 0- 6 Hr.

Alternate Program for II, III, IV

I. *Graduate Courses in one of the candidate's certified teaching fields* . . . . . 18-24 Hr.

II. *Free electives (non-Education)* . . . . . 0- 6 Hr.

TOTAL FOR MASTER'S DEGREE . . . . . 30-36 Hr.

†NOTE: In some programs listed on pp. 128-131 a combination of undergraduate courses and courses listed in a graduate program is necessary to meet certification requirements.

[1]A—Thesis required
B—Research problem required
C—36 semester hour program
D—Concentration in reading

*May be taken as internship courses.
**This provision does not apply to candidate pursuing Programs A or B.

CURRICULUM FOR INDUSTRIAL ARTS TEACHERS*

Degree: Master of Arts

I. *Required Courses*	*Option* A	B	C
Ed. 271	3	3	0
Ed. 301	3	3	3
Ed. 303	3	3	3
Ed. 310	3	3	3
Ed. 311	3	3	3
Ed. 360	0	3	0
Ed. 361	6	0	0
Ed. 365	3	3	3
TOTAL	24	21	15

II. *Approved Electives in Education*	6	9	21
(Students electing Option C should maintain a close balance in total hours between professional and academic courses.)			
Ed. 204(IA), 221, 238(IA), 240(IA), 243(IA), 244(IA), 246(IA), 248(IA), 249(IA), 250(IA), 251, 270, 271, 272, 275, 284, 285, 301, 319, 320, 321, 322, 324, 331, 336, 338, 339, 346, 348, 351, 353, 364, 368, 369, 370, 371, 372, 373, 374, 375, 385, 395, 396, 397, 398, 399.			
TOTAL FOR MASTER'S DEGREE	30	30	36

Option A—Thesis required
B—Problem required
C—36 hour program

*See dagger footnote on p. 128.

CURRICULUM FOR AUDIO-VISUAL EDUCATION*

Degree: Master of Arts

I. *Required Courses* Program[1]	A	B	C
Ed. 221	3	3	3
Ed. 251	2	2	2
Ed. 322	2	2	2
Ed. 351	3	3	3
Ed. 346	3	3	3
Ed. 301	3	3	3
Ed. 360	0	3	0
Ed. 361	6	0	0
TOTAL	22	19	16
II. *Approved Electives*			
Ed. 246, 270, 271, 315, 335 or 336, 338, 339, 341, 380-383, 395-398	8	11	20
Journalism 302			
Speech 242, 243, 244			
TOTAL FOR MASTER'S DEGREE	30	30	36

[1]A—Thesis required
B—Research Problem required
C—36 semester hour program

*See dagger footnote on p. 128.

CURRICULUM FOR HOME ECONOMICS EDUCATION*

Degree: Master of Science

I. *Required graduate courses in Education*	10-20 Hr.
II. *Required graduate courses in Home Economics*	10-20 Hr.
III. *Required graduate courses in tributary fields*	0-10 Hr.
TOTAL FOR MASTER'S DEGREE	30-36 Hr.

*See dagger footnote on p. 128.

CURRICULUM FOR JUNIOR HIGH-SCHOOL CLASSROOM TEACHERS†

Degree: Master of Arts

I. *Required Courses*	Program	A	B	C
Ed. 285		2	2	2
Ed. 301		3	3	3
Ed. 336		3	3	3
Ed. 360		0	3	0
Ed. 361		6	0	0
		14	11	8
II. *Graduate Courses in Student's Certified Field or Fields:*		10	10	10-18
III. *Approved Electives:*		6	9	10-18
Ed. 221, 259, 270, 271, 275,* 284, 301, 304,* 305, 306, 307, 308, 309, 331, 348, 360, 361, 373.*				
TOTALS		30	30	36

*Recommended Electives.
*See dagger footnote on p. 128.

CURRICULUM FOR ELEMENTARY SCHOOL CLASSROOM TEACHERS*

Degree: Master of Arts

I. *Required Courses:*	Program[1]	A	B	C	D	E
Ed. 271		3	3	3	3	3
Ed. 301		3	3	0	3	3
Ed. 306		3	3	3	0	0
Ed. 307		3	3	3	0	0
Ed. 308		3	3	3	3	3
Ed. 309		3	3	3	3	3
Ed. 331		3	3	3	3	3
Ed. 335		3	3	3	0	0
Ed. 360		0	3	0	3	3
Ed. 361		6	0	0	0	0
TOTAL		30	27	21	18	18
II. *Approved Electives:*		0	3	15	12	12
Ed. 202, 221, 223, Astronomy 216, Mathematics 270, Mathematics 271, Ed. 270, 274, 285, 301, 304, 305, 306, 307, 347 (Reading for the Mentally Retarded), 313, 315, 316, 317, 335, 346, 342, 348, 366, 368, 370, 371, 372, 375, 380, 385, or academic courses approved by the adviser. (Academic deficiencies will have first consideration.)						
TOTAL FOR MASTER'S DEGREE		30	30	36	30	30

[1]A—Thesis required
B—Research problem required
C—36 semester hour program
D—Concentration in Reading
E—Concentration in Elementary Mathematics

*See dagger footnote on p. 128.

CURRICULUM FOR TEACHER-LIBRARIANS*

(Graduate Option B Only)

Degree: Master of Arts in Education

I.	*Graduate Courses in Education*	12 Hr.
	A. Required Courses in Education Ed. 301 Ed. 360 (Library Science)	6 Hr.
	B. Electives in Education Ed. 221, 270, 271, 322, 331, 339, 373, 385.	6 Hr. (Min.)
II.	*Graduate Courses in Library Science* At least 6 hours must be in the 300 series.	12-18 Hr.
III.	*Electives*	0-6 Hr.
	Total for Master's Degree	30 Hr.

*See dagger footnote on p. 128.

CURRICULUM FOR CLASSROOM TEACHERS IN SPECIAL EDUCATION*

Degree: Master of Arts

I. *Required Courses:*	Program[1]	A	B	C
Ed. 223		3	3	3
Ed. 250		3	3	3
Ed. 301		3	3	0
Ed. 323		3	3	3
Ed. 347		3	3	3
Ed. 360		0	3	0
Ed. 361		6	0	0
Ed. 368		3	3	3
Ed. 369		3	3	3
Ed. 371		0	0	3
Ed. 375		3	3	3
Psych. 229		0	0	3
Psych. 236		0	3	3
Total		30	30	30
II. *Approved Electives*		0	0	6
Ed. 221, 270, 271, 301, 304, 308, 309, 313, 317, 324, 331, 335, 336, 348, 373, 376 Psych. 218, 238 Speech 250				
Total for Master's Degree		30	30	36

[1]A—Thesis required
B—Research problem required
C—36 semester hour program

*See dagger footnote on p. 128.

CERTIFICATE OF ADVANCED STUDY IN EDUCATION

This program is designed to prepare school and related personnel who wish professional training beyond the Master's degree. Candidates for this Certificate may choose from among the following areas of study for their area(s) of concentration: (a) Administration, (b) Supervision, (c) Reading, (d) Special Education, (e) Curriculum, (f) College Teaching, (g) Physical Education, and (h) other approved areas. Persons interested in this certificate should consult the Dean of the College of Education.

Prerequisites to Admission to the Program

1. General requirements for admission to the Graduate School of West Virginia University.
2. A Master's degree with a grade-point average of 3.0 or higher.
3. A minimum of three years of teaching or closely related educational experience.

Requirements for Admission to Candidacy

1. Evidence through examination, personal letter, and personal interview of general proficiency, acceptable standards of oral and written communication, and good health.
2. Satisfactory completion *in residence* at West Virginia University of at least six semester hours of approved course work beyond the conferring of the Master's degree.
3. Students admitted after September 1, 1962, must submit scores in the general aptitude test of the Graduate Record Examination.

Requirements for Completion

The Program: An approved program consisting of a minimum of 30 semester hours earned above the Master's degree of which 24 semester hours will be course work in Education and closely related fields and six hours of research.

At least 24 semester hours of the work credited for this Certificate must be done in residence at West Virginia University. This requirement includes the six hours of research which may be conducted apart from the physical limits of the University but must be done under the direction and supervision of the chairman of the student's graduate committee. A maximum of six semester hours earned in residence at another approved graduate institution or in West Virginia University Extension may, if approved by the student's adviser, be allowed toward credit for the Certificate.

Final Examination(s): Upon completion of all requirements including the research report, the candidate will be admitted to a final oral examination by his graduate committee.

Time Limitation: All requirements must be completed within seven calendar years immediately preceding the awarding of the Certificate.

THE DEGREE OF DOCTOR OF EDUCATION

The College of Education offers the degree, Doctor of Education, in three major areas: Administration, Curriculum and Instruction, and School Services. These three major areas permit the student to concentrate in General Administration, Principalship, Supervision, Curriculum, Guidance and Counseling, and Teaching.

Other administrative units in the University cooperate with the College of Education in providing appropriate courses in areas of concentration.

Admission to the Doctoral Program

Applicants who pursue a program leading to the Doctor of Education degree are required to: (a) be admitted to the Graduate School of West Virginia University, (b) furnish evidence of three or more years of successful teaching and/or closely related experience, (c) hold a Master's degree or its equivalent with a minimum grade-point average of 3.0, and (d) students admitted after September 1, 1962, must submit scores in the general aptitude test of the Graduate Record Examination. A student who meets these qualifications will be assigned a temporary program adviser after his records have been received by the Dean of the College of Education.

Preliminary Examination

The preliminary examination, for which the student must make an official application, is administered during second week of November, and July. Usually this examination will be taken after the completion of six to twelve semester hours of graduate work at West Virginia University. The purpose of this examination

is to determine, on the basis of the following information, the advisability for the student to proceed toward admission to candidacy:

1. The experience background of the student.
2. The undergraduate record.
3. Record of progress in graduate courses.
4. Results of written tests, including scores on the Graduate Record Examination.
5. The ability to do analytical thinking and the ability to express himself particularly in the areas of curriculum, and the historical, philosophical, sociological, and psychological foundations of education.

Doctoral Committee

When the student has successfully completed the preliminary examination, a permanent adviser will be appointed to serve as chairman of the doctoral committee. This committee will consist of a minimum of five members of whom at least one will be from a discipline other than education.

Curriculum

The program of course work shall include a minimum of 70 semester hours exclusive of the dissertation of which a minimum of 24 semester hours shall be in professional education and a minimum of 24 semester hours in a minor area of concentration in a supporting discipline or disciplines. At least one-half of the semester hours in education and one-third of the hours in the minor supporting discipline shall be on the 300 level.

Candidates having a previously earned graduate degree or its equivalent from West Virginia University will be required to complete a prescribed number of resident graduate hours in one or more selected institutions.

Admission to Candidacy Examinations

The Admission to Candidacy Examination will be taken after the student has completed approximately 30 hours of course work. The examination conducted during the second week of March and July will be administered in two parts: (a) written, (b) oral.

a. The written portion will cover the following six areas:

1. Curriculum and instruction.
2. History and philosophy of education.
3. Research and statistics.
4. Sociological and psychological foundations of education.
5. Major area of concentration.
6. Minor area of concentration in a supporting discipline.

b. The oral portion will be conducted by the student's doctoral committee under the direction of the committee chairman. The examination will include the following:

1. Comprehensive and definitive knowledge in the major field.
2. Comprehensive knowledge of the minor area of concentration in a supporting discipline or disciplines.
3. A working knowledge of the classic and current literature in the major area of concentration.
4. Awareness and understanding of issues in the major area of concentration.
5. Knowledge of and ability to do research appropriate to the area of concentration.

Dissertation

The candidate must submit and justify a prospectus for the dissertation, to be approved by the doctoral committee, on a problem in the field of major interest.

Final Examination

When the candidate's dissertation has been completed and when he has fulfilled all other requirements, he will be admitted to a final oral examination on the dissertation before his committee.

Residence

In general, requirements for the Doctor of Education degree contemplate three years of full-time graduate work beyond the Bachelor's degree, including a minimum of two semesters (after completion of the Master's degree) in residence as a full-time graduate student at West Virginia University.

Time Limitation

Requirements for the Doctor of Education degree must be completed within seven years after successful completion of the preliminary examination.

COURSES OF INSTRUCTION

202. Early Childhood Education. S. 2 hr. PR: Consent. Application of principles of psychology to early childhood education.

204. Advanced Woodworking, Construction, and Finishing (IA). II, S. 3 hr. PR: Ed. 102 (IA), 103 (IA), or equiv. Selection of advanced projects, analysis of construction, planning, and finishing, application of machine tools.

221. Audio-Visual Resources for Instruction. I, II. S. 3 hr. PR: Ed. 105, 106. A survey is made of the many types of materials available for teaching. Multi-sensory techniques, sources of materials, and practical classroom utilization are considered. One hour laboratory period per week is arranged.

223. Student Teaching Clinical Experience in Elementary, Secondary, Reading, Mathematics, and Special Education. I, II, S. 2-4 hr. PR: Consent. This is an advanced course in student teaching, stressing clinical procedures in classroom learning problems, industrial arts therapy, and other related areas.

227. Materials and Methods in Public-School Speech and Hearing Therapy. I, II, S. 2-4 hr. PR: Consent.

238. Design in Industrial Education (IA). I, S. 3 hr. PR: Consent. Industrial education design; architectural drawing and model building. Emphasis on application of design components at the secondary school level.

240-250. These courses are designed to prepare versatile teachers of industrial arts and to meet State certification requirements. The abbreviated introduction to specific crafts through these courses is intended to provide broad rather than specialized experience and to prepare the teacher to teach the fundamentals of crafts rather than to attain vocational competence. Prospective teachers should elect, from these courses, those which will supplement their previous training in organizing and directing the industrial arts program.

240. Art Metal and Jewelry (IA). I, S. 3 hr. PR: Ed. 104 (IA) or equiv. Creative design and construction of art metal and jewelry involving the utilization of sheet, bar, and wire stock. Development of units suitable for the secondary school level is stressed.

242. Upholstery and Finishing (IA). I, S. 3 hr. PR: Ed. 102 (IA), 103 (IA) or equivalent and consent. Design and construction of upholstery units, reupholstery, finishing and refinishing. Construction of teaching units in these areas.

243. Advanced Ceramics (IA). II. 3 hr. PR: Ed. 121 (IA) or consent. Design in ceramics, construction of projects involving mold work, potter's wheel, and hand form methods. Experimentation with glazes including glaze composition. Development of suitable teaching aids involving ceramics.

244. Advanced Industrial Arts Crafts (IA). II, S. 3 hr. PR: Ed. 121 (IA). Experiments with crafts media in depth in the areas of plastics and leather. Development of suitable teaching units involving crafts materials.

246. Advanced Industrial Arts Graphics (IA). II, S. 3 hr. PR: Ed. 180 (IA) or equiv. Concentration in depth in one or more of the graphic arts media. Emphasis on offset methods of reproduction.

248. Advanced Electricity (IA). II, S. 2 hr. PR: Ed. 131 (IA) or equiv. A study of the technical phases of electricity with emphasis on planning shop courses, shop equipment and layout, and development of industrial aids.

249. Sheet Metal Pattern Development (IA). II, S. 3 hr. Layout problems involving parallel, radial, and triangulation methods. Construction of in-instructional units utilizing these principles.

250. Industrial Arts in Special Education (IA). II, S. 3 hr. Experimentation with industrial arts crafts suitable for instruction in special education classes. Discussion of factors involved in selection and manipulation of such media as leather, plastics, ceramics, wood, and metal.

251. Production of Audio-Visual Materials. I, II. S. 2 hr. PR: Ed. 221. Techniques of making audio-visual materials for use in teaching and school public relations programs are demonstrated. Individual projects of planning and producing materials are carried out by the student.

259. The Music Education Program. S. 3 hr. PR or parallel: Ed. 124 or consent. Organization and administration of the complete Music Education program for grades 1 through 12.

262. Vocational Home Economics in Secondary Schools. II. 3 hr. PR or parallel: Ed: 120, 124, 163; 25 hr. in Home Economics. Primarily for seniors and teachers of home economics.

270. Special Problems and Workshops. I, II, S. 2-4 hr. PR: 14 hr. in Education. To take care of credits for special workshops and short intensive unit courses on methods, supervision, and other special topics. Maximum of 8 semester hours may be applied toward the Master's degree, of which no more than 6 semester hours shall be in Extension.

271. Educational Measurement. I, II, S. 3 hr. PR: Consent. Background for educational measurement, the nature of evaluation, measuring and predicting pupil progress. Statistics includes measures of central tendency, percentiles, variability, and simple correlation. First course in statistics and research.

272. Internship in Industrial Arts Therapy (IA). I, II, S. 8 hr. Internship in a clinical setting providing individualized instruction in the teaching techniques of industrial arts and therapeutic practices in rehabilitation of the handicapped.

274. Workshop: Economic Education. S. 3 hr. A workshop for principals, teachers, and supervisors with emphasis on the economic structure of our society and methods of integrating economics into the school program. Sponsored jointly by the College of Education and the College of Commerce.

275. Curriculum Principles and Patterns in General Education. II. 2 hr. PR: 6 hours undergraduate education and senior rank. Major emphasis on principles, philosophy, and concepts of general education in secondary schools; means and ends in general education: core, subject matter, integrated studies, broad fields, activity.

276. Teaching Young and Adult Farmer Classes. I, S. 2 hr. PR: Ed. 100, 105, 106. Participation in conducting young and adult farmer classes and school-community food preservation centers; organization, course of study, and methods of teaching and supervision, and young farmers' association.

277. Organizing and Directing Supervised Farming Programs. II, S. 2 hr. PR: Ed. 160 or consent. Planning programs of supervised farming, supervising and evaluating such programs for all-day students, young farmers, and adult farmers.

284. Pupil-Personnel Administration. I, II, S. 2 hr. PR: Ed. 100, 105, 106. Pupil accounting, guidance, extracurricular activities, and control. Open only to senior students and graduates.

285. The Junior High School. I, II. 2 hr. PR: Ed. 100, 105, 106, and consent. Development, philosophy, program, and practices of the junior high school.

301. Introduction to Educational Research. I, II, S. 3 hr. PR: Ed. 271 or 372. Required of all candidates for the administrative, supervisory, Options A and B for the Master's degree and several other programs. Methods, techniques, statistical measures, interpretations, and reporting of research.

303. History of Industrial Education. I, S. 3 hr. Survey of development of industrial education in Europe and America to 1917. Research on modern development since 1917 including contributions of contemporary leaders.

304. Corrective Techniques in Reading Instruction. II, S. 3 hr. PR: Ed. 309. A basic course in corrective reading for classroom teachers. Special emphasis on the correction of reading difficulties by the classroom teacher with equipment and materials available to the average classroom.

305. Survey of Major Issues in Reading. II, S. 2 hr. PR: Ed. 309. An advanced course in the major problems confronting the teacher or supervisor of reading instruction. Essentially a research course in which each student will have the opportunity to complete an individual problem in an area of special interest.

306. Social Studies in the Elementary School. I, II, S. 3 hr. Comprehensive consideration of objectives, content, methods, including unit procedures; materials including objects, models, exhibits, and museum items as well as textbooks, collateral reading, maps, and graphs; and means of evaluating social growth and development.

307. Science in the Elementary School. I, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education, or consent. An analysis of methods, curriculum patterns, and trends in elementary school science. Attention is given to the understanding and development of scientific attitudes appropriate at the elementary school level.

308. Mathematics in the Elementary School. II, S. 3 hr. PR: 10 hr. of undergraduate credit in elementary education or consent. Materials and methods of instruction for modern mathematics programs.

309. Foundations of Reading Instruction. I, S. 3 hr. A basic course in teaching reading, grades 1-12. It is planned to give students who have little or no background in reading an opportunity to study the reading process and to learn how to apply effective techniques and methods to classroom teaching of reading.

310. School Shop Planning. I, S. 3 hr. Selection, purchase, arrangement, installation and use of equipment for all instructional levels and types of school shop laboratories. Construction of 3-D scale models of typical industrial education laboratory facilities.

311. School Shop Safety Programs. II, S. 3 hr. Consideration of factors involved in school shop accidents; safety measures appropriate to schools and industry; theory of tort liability involving industrial education teachers.

313. Elementary-School Guidance. I, II, S. 2 hr. PR: Consent. Practical application of the principles of guidance to the elementary school.

315. Current Practices in Elementary Education. I, II, S. 2 hr. PR: Consent. Critical analysis of modern techniques and practices in the elementary school.

316. Corrective Techniques in Mathematics Education. I, S. 3 hr. PR: Ed. 308. Materials and methods used in diagnosis and remediation of learning difficulties in mathematics.

317. Survey of Major Issues in Mathematics Education. II, S. 3 hr. PR: Ed. 308 and 316. Individual and group research on selected topics in mathematics education.

318. Planning Programs and Courses for Vocational Agriculture Departments. I, S. 2 hr. PR: Ed. 124. Gathering data, studying the farming problems of all-day students, young farmers, and adult farmers, and planning the total program for the department.

319. Special Problems in Teaching General Shop. S. 3 hr. PR: Ed. 107 (IA) or equivalent. Problems peculiar to teaching industrial arts in the general shop.

320, 321. Special Topics in Industrial Arts. I, II, S. 2-3 hr. each. PR: Consent. For graduate students in industrial arts. Special projects of improvement in phases needing special attention.

322. Organizing Audio-Visual Programs. II, S. 2 hr. PR: Ed. 221. Audio-visual techniques with emphasis on selection and utilization of materials, audio-visual centers, inservice programs, budgetary planning, and curricular implementation.

323. Mathematics for the Mentally Retarded. I, S. 3 hr. PR: Consent. Materials and methods for teaching mathematics to the mentally retarded child.

324. Administration of Individual Intelligence Tests. I, II, S. 4 hr. Techniques in administering, scoring, and interpreting individual mental ability tests.

325. Practice in Administration in Elementary Schools. I, II. 2 hr. PR: Consent. Practice in leadership pertaining to elementary school organization and administration according to the needs of the school and/or school system.

326. Practice in Elementary-School Supervision. I, II, S. 2 hr. PR: 6 graduate hours of elementary education, or consent. Observing and practicing major activities of the supervisor in work with pupils and teachers. To be taken late in student's candidacy.

327. Demonstration and Practice in the Supervision of Secondary-School Instruction. I, II, S. 3 hr. PR: Consent. Observation and practice of approved methods and techniques in classroom supervision of instruction. To be taken late in student's candidacy.

328. Practice Administration in the Secondary School. I, II, S. 2 hr. PR: Consent. Internship study of school organization and administration.

331. Philosophy of Education. I, II, S. 3 hr. A study of educational aims, values, and criteria of education in a democracy. Stresses different systems of educational philosophies, the nature of thinking applied to methods, and subject matter.

335. The Elementary-School Curriculum. I, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education, or consent. An analysis of curriculum designs in elementary education with emphasis on methods and techniques of development.

336. The Secondary-School Curriculum. I, II, S. 3 hr. PR: High-school teaching experience, or consent. Emphasizes socio-economic and cultural influences on the curriculum; principles of curriculum development; curriculum building in the various teaching fields; techniques of experimentation and evaluation; and practice in curriculum building with special emphasis on unit construction.

337. Problems in Elementary and Secondary-School Curriculum. I, II. 2 hr. PR: 8 hr. graduate education, including Ed. 336. Critical study of selected problems in curriculum with special emphasis on research.

338. Problems in the Secondary School. I, II. 2 hr. PR: Consent. Culminating internship course for principals. Required research project designed to improve instruction and/or administration of the school.

339. Public School Organization and Administration. I, S. 3 hr. PR: 20 hr. of education courses. Provides basic concepts through which administrators, supervisors, and teachers gain understanding of basic problems related to the operation of schools and school systems.

340. Public-School Finance. II, S. 3 hr. PR or Conc.: Ed. 339 and consent. Sources of school support; taxation; efficient management of school money, improved budget practices and adequate apportionment plans. To be taken late in student's candidacy.

341. School Buildings and Equipment. I, S. 2 hr. PR or Conc.: Ed. 339 and consent. Philosophy, planning, and management of the school plant as an appropriate educational environment.

342. Public Education and the Law. I, S. 3 hr. Legal permissives and limitations involved in setting policy for, organization of, and administration of public schools.

343. School Surveys. I, II, S. 2 hr. PR or Conc.: Ed. 339 and consent. Development of the educational survey as an instrument for improving educational procedures.

344. Staff-Personnel Administration. S. 2 hr. PR or Conc.: Ed. 339, consent. Selection, induction, direction, evaluation, improvement, and promotion of members of the administrative, supervisory, instructional, research, clerical, and maintenance staffs.

345. Seminar in Educational Leadership. I, II, S. 2-8 hr. PR: Consent. An integrated study of the problems of school leaders in the areas of administration, supervision, and instruction.

346. Principles of Supervision. I, II, S. 3 hr. PR: Consent. Basic, general principles of elementary-school, junior high-school, and senior high-school supervision.

347. Reading for Mentally Retarded Children. I, S. 3 hr. Designed especially for majors in Special Education. Emphasizes the techniques, methods, and materials most effective for teaching reading to sub-normal children.

348. Human Development and Behavior. I, II, S. 3 hr. A study of the interrelationship of physical and environmental factors as these affect behavior of children and youth.

349. Psychological Foundations of Learning. I, II, S. 3 hr. A study of the psychological and philosophical foundations of major learning theories.

350. Inter-Disciplinary Seminar for School Administrators. I, II. 6 hr. PR: Consent. A study of the academic disciplines pertinent to school administration.

351. Communications and New Educational Media. I, S. 3 hr. The psychological implications of communications media in learning and teaching. Attention to educational television, programmed instruction, cross-media, techniques, and experimental and developmental programs.

353. The Secondary-School Principal. S. 3 hr. PR: Ed. 339 and high-school teaching experience, or consent. Open only to graduate students in Education, late in candidacy. Practicum in secondary-school administration.

356. Elementary-School Principal. S. 3 hr. PR: 6 graduate hours of elementary education, or consent. A study of the function of administration and supervision in the modern elementary school, emphasizing the role of the principal as an instructional leader. Designed particularly for persons preparing for administrative and supervisory positions (to be taken late in candidacy.)

360. Problem in Education. I, II, S. 3 hr. Research for Master's degree in Education, option B.

361. Thesis in Education. I, II, S. 6 hr. Research for Master's degree in Education, option A.

362. Project in Education. I, II, S. 3-6 hr. Research for the program leading to the Certificate of Advanced Study in Education.

363. Dissertation. I, II, S. 6 hr. per sem. Research for the Doctor of Education degree.

364. Advanced Methods in Teaching Industrial Education. II, S. 3 hr. PR: Ed. 194 or consent. Trends in Industrial Education reflecting modern teaching methods; classroom representation of industrial methods; effective use of the newer instructional media.

365. Curriculum Construction in Industrial Arts. S. 3 hr. PR: Consent. Techniques used in building curriculum designs in industrial arts.

366. Teaching the Language Arts. I, S. 3 hr. PR: Consent. A study of the interrelationships among the different phases of the language arts. Special attention is given to organizing the language arts program, selecting materials and equipment, and understanding effective techniques and methods for teaching, listening, oral language, written language, handwriting, and spelling.

367. Social Studies in Secondary Schools. I, S. 3 hr. PR: Consent. Nature and function of social studies in the secondary school; utilization of community, state, national, and world resources in teaching; selection of content for teaching purposes; curriculum construction with emphasis on resource and teaching units.

368. Nature and Needs of Exceptional Children. I, II, S. 3 hr. PR: Consent. Etiology, philosophy, and education of mentally retarded, physically handicapped, and mentally advanced. Overview of identification of exceptional children, their training and possibility of placement.

369. Curriculum, Materials, and Methods for the Mentally Retarded. I, II, S. 3 hr. PR: Consent. History and philosophy of teaching the mentally retarded. Identification, curriculum, materials and methods of teaching the mentally retarded.

370. Principles of Instruction. I, II, S. 3 hr. PR: Consent. Emphasizes the basic principles of teaching-learning process implied in major learning theories; study of factors in learning such as problem solving, competencies needed by teacher; improving techniques common to traditional and modern methods of instruction.

371. Curriculum, Materials, and Methods for Mentally Gifted. I, II, S. 3 hr. History and philosophy, identification, curriculum, materials and methods of working with mentally gifted.

372. Statistical Analysis in Education. I, II, S. 3 hr. PR: Ed. 271 or consent. Review measures of central tendency, percentiles, and correlation. Emphasis placed on correlation, regression, testing hypotheses, non-parametric tests, and other measures in analysis and inference.

373. Basic Course in Guidance. I, II, S. 3 hr. An overview of a total guidance program.

374. Educational and Occupational Information Service. I, S. 2 hr. PR: Ed. 373. Methods of gathering and disseminating occupational and educational information.

375. Individual and Group Inventory Techniques. I, II, S. 3 hr. PR: Ed. 373 and consent. Comprehensive study of all objective measures used in schools; techniques of administering and interpreting to individuals and groups; developing testing programs and costs.

376. Counseling Techniques and Special Counseling Problems. I, II, S. 3 hr. PR: Ed. 373, 374, 375. Analytical consideration of identifying causes and development of psychological maladjustments. Seminar study of counseling techniques with practice under supervision.

377. Advanced Studies of Human Adjustment. I, II, S. 3 hr. PR: Ed. 373, 374, 375, 376. Clinical consideration of identification, causes, and development of psychological maladjustments; further study of developments in counseling and background in advanced studies in guidance.

378. Organization and Administration of Guidance. II, S. 2 hr. PR: Ed. 373, 374, 375, 376. Operation of guidance programs in terms of personal functions, relationships, physical facilities, instructional integration, financial standards, law and regulations.

380, 381, 382, 383. Practice in Supervision. I, II. Credit: 2 hr. ea. PR: Assignment to actual full-time work in supervision in a school system, previous certification, and consent. Each course a continuation of the preceding. To complete the entire 8 hours, not less than two full years of field experience will be accepted.

385. Historical and Sociological Foundations of American Education. I, II, S. 3 hr. A study of the development of American education. Emphasis placed upon movements and leaders.

395, 396, 397, 398. Practicum. I, II, S. 2-4 hr. per sem. or term—aggregating not more than 12 hr. PR: 8 graduate hr. in Education. Enrollment with permission of adviser or instructor in consultation. Special individual and group projects.

To provide appropriate residence credits for special workshops, prolonged systematic conferences on problems and projects in Education. Credits in these projects cannot be substituted for required courses.

Agricultural Education: Mr. Butler
Audio-visual Education: Mr. Huffman
Education Measurement and Evaluation: Mr. Bailey and Mr. Gautier
Educational Psychology: Mr. Bailey, Mr. McAvoy, Mr. Neff, and Mr. Wagner
Elementary Education: Mr. Katz, Mr. Kennedy, and Mr. Bell
Guidance: Mr. Jarecke, Mr. Wagner
Home Economics Education: Miss Brown
Human Growth and Development: Mr. Wagner, Mr. McAvoy, and Mr. Orlandi
Industrial Education: Mr. Ault and Mr. Brennan
Music Education: Mr. Brown
Philosophy of Education: Mr. Bell
Reading: Mr. Kennedy
School Administration: Mr. Bell, Mr. Gautier, Mr. Harrah, Mr. Hofstetter, and Mr. Miller
Secondary Education: Mr. Cook and Mr. Miller
Special and Adult Education: Mr. Neff
Supervision: Mr. Harrah
Teaching of Mathematics: Mrs. Cunningham
Teaching of Science: Mr. Katz
Teaching of Social Studies: Mr. Cook, Mr. Bell, and Mr. Gautier
Vocational Education: Miss Brown and Mr. Butler

399. Seminar in Educational Research. II. 2 hr. PR: Ed. 301 and consent. Application of research methods and techniques to problems in modern education; analysis and implications of results.

ENGINEERING

Requirements for Admission

A student desiring to take courses for graduate credit in the College of Engineering must first comply with the appropriate regulations of the Graduate School.

After having been admitted to the Graduate School, a student who intends to become a candidate for a degree must apply for admission to the major department of his choice. Acceptance by the major department will depend upon review of the student's academic background and the available facilities in the department.

An applicant with a baccalaureate degree, or its equivalent, from a department accredited by the Engineers' Council for Professional Development will be admitted on the same basis as engineering graduates of West Virginia University. Lacking these qualifications, an applicant must first fulfill the requirements of the department in which he is seeking an advanced degree.

Admission to candidacy for a graduate degree is required prior to obtaining that degree. A graduate student may apply for admission to candidacy by formal application after completing a minimum of 12 semester hours of graduate courses with a grade-point average of at least 3.0, based on all graduate courses, taken in residence, for which he has received a grade at the time of application.

Academic Standards

No credits are acceptable toward an advanced degree which are reported with a grade lower than C.

To qualify for an advanced degree, the graduate student must have a grade-point average of at least 3.0 based on all graduate courses for which he has received a grade from the University.

Curricula

Each candidate for a degree must select his major subject in that department in which his degree is taken:

Ph.D. Degree—See departmental descriptions.

M.S. Degree—Each department has a designated M.S. degree and in addition the College has an undesignated degree, Master of Science in Engineering. For all M.S. degrees each candidate will, with the approval of his graduate committee, follow a planned program which must conform to one of the following outlines:

1. A minimum of 30 semester credit hours, not more than 6 of which are in research leading to an acceptable thesis.
2. A minimum of 33 semester credit hours, not more than 3 of which are in research leading to an acceptable problem report.
3. A minimum of 36 semester credit hours, with no thesis or problem report required.

At least one-half of the courses taken, exclusive of research, must be in the College of Engineering with as many as possible at the 300 level.

A graduate student in the College of Engineering must comply with the regulations of his major department.

MASTER OF SCIENCE IN ENGINEERING

This interdepartmental degree program is designed for students who desire to pursue work in areas other than that of their baccalaureate degree in engineering or science. Graduate students who wish to become candidates for this degree should register with the department in which the major portion of the work is to be done.

Admission and Academic Standards. Students must comply with the rules and regulations as outlined under Requirements for Admission and Academic Standards for graduate work in the College of Engineering.

Adviser and Examining Committee. Each student will be assigned an adviser and an advisory and examining committee will be appointed by the department in which the major portion of the work is to be done.

Final Examination. On completion of the course requirements a candidate for the degree of Master of Science in Engineering shall be required to pass a final examination which may be written, or oral, or both, covering both course material and the thesis or problem report, depending upon the option selected.

THE DEGREE OF DOCTOR OF PHILOSOPHY

Admission. Admission to the Graduate School of West Virginia University is required of all applicants for admission to a program of study and research leading to the Ph.D. in Engineering. Applicants for admission are expected to have successfully completed a Bachelor of Science or Master of Science degree program in some phase of engineering equivalent to the program leading to this degree in effect at West Virginia University. Admission to the Graduate School does not necessarily assure entrance into the College of Engineering Ph.D. program. Normally, applicants are expected to have either (1) a minimum of 3.0 (B) average computed from the last two academic years of course work completed for the Bachelor of Science degree, or (2) a Master of Science degree from an institution having an accredited undergraduate program in the field in which the Master of Science degree was awarded.

Requirements for Candidacy. After admission to the program and after a period of residence, the applicant will be admitted to a comprehensive preliminary or qualifying examination (either oral or written or both) in which he must demonstrate: (a) a grasp of the important phases and problems of the field of study in which he proposes to major and an application of their relation to other fields of human knowledge and accomplishments; (b) the ability to employ rationally the instruments of research developed in his major field; and (c) the ability to read two approved languages in a satisfactory manner.

When an applicant has successfully passed his comprehensive examination he will be formally admitted to candidacy for the Doctor's degree. Admission to candidacy must precede the final examination for the Doctor's degree by at least one academic year. Graduate courses pursued in fulfillment of the requirements for the Master's degree, if of suitable character and quality, may be credited toward the doctorate.

Curriculum. The degree of Doctor of Philosophy is not awarded for the mere accumulation of course credits nor for the completion of a definite residence requirement. The exact amount and nature of the course work to be undertaken by a candidate will be established for each individual candidate with the object of insuring a rational and coherent progression of academic development beyond the Bachelor of Science degree. A minimum of 60 semester hours of course work beyond the Bachelor's degree is required exclusive of research or thesis, except research or thesis credits not to exceed 6 hours earned towards the Master's degree. No more than 36 semester hours of graduate course work may be taken in absentia and transferred to West Virginia University for application toward the requirements of the Doctor of Philosophy degree.

Residence. The requirements for the degree of Doctor of Philosophy contemplate at least three years of full-time graduate work beyond the Bachelor's degree. A minimum of 36 weeks in residence in full-time graduate study or its equivalent at West Virginia University is required, and must include a minimum of two semesters at the University.

Dissertation. The candidate must submit a dissertation on a topic within the area of his major interest. The dissertation must represent the results of independent research and must constitute a definite contribution to knowledge. It is anticipated that the work leading to the completion of the dissertation would require the equivalent of approximately 30 semester hours.

Final Examination. Upon completion and approval of the dissertation and fulfillment of all other requirements, the candidate shall pass a final examination conducted by a committee of at least five members recommended by the major department and appointed by the Dean of the Graduate School. The examination shall be primarily a defense of the dissertation although other questions necessary to establish the validity of the dissertation may be in order.

AEROSPACE ENGINEERING

Master of Science in Aerospace Engineering

Students must comply with rules and regulations as outlined in General Requirements for graduate work in the College of Engineering.

Thesis. Normally a thesis is required of all candidates for the degree of Master of Science in Aerospace Engineering. Approval by the Advisory and Examining Committee is necessary before the thesis will be accepted. The thesis must be presented in a form that conforms to general requirements of the Graduate School, and in addition should conform to additional thesis requirements of the Department of Aerospace Engineering.

Whether or not a thesis is required shall be determined by the department and shall be recorded in the student's file as a part of his planned program.

Final Examination. Each candidate for the Master's degree shall pass a final examination administered by his Advisory and Examining Committee. This examination may be written, or oral, or both, and may cover course material. If a thesis has been required, the examination shall also cover the thesis.

Courses. The following grouping of courses is given as a guide for selecting a graduate program leading to the degree of Master of Science in Aerospace Engineering.

Group I. Required of all candidates. Six semester credit hours of advanced mathematics beyond a first course in differential equations.

Group II. Major. Minimum of 9 semester hours of Aerospace Engineering courses, other than A.E. 397, in the 300 series.

In order to meet the minimum requirements for the degree of Master of Science in Aerospace Engineering, additional courses may be taken from the following, subject to the approval of the student's Advisory and Examining Committee:

1. Courses from Groups I and II.
2. Aerospace Engineering courses in the 200 series which are not required for the degree of Bachelor of Science in Aerospace Engineering of West Virginia University.
3. Physics and Chemistry courses in the 200 or 300 series.
4. Courses in other departments of the College of Engineering in the 200 or 300 series.

A.E.

201. Fluid Dynamics I. 4 hr. PR: Math. 253; or conc: M.E. 120, A.E. 116. Standard atmosphere, thermodynamics of fluid flow, types of fluid motion, airfoils, wings, drag, heat transfer through boundary layers, introduction to flight vehicle performance. 4 hr. lec.

202. Fluid Dynamics III. 3 hr. PR: Math. 253, A.E. 201. Steady flow of incompressible fluids. Stream functions and potential theory of two dimensional ideal flows. Flow equations in vector notation. Conformal transformations and airfoil development. Viscous and three dimensional effects on ideal flows. Two and three dimensional vortex flows. 3 hr. lec.

203. Applied Aerodynamics. 3 hr. PR: A.E. 209. Chordwise and spanwise airload distribution for plain wings, wings with aerodynamic and geometric twist, wings with deflected flaps, and wings with ailerons deflected. Section induced drag characteristics. 3 hr. lec.

205. Experimental Fluid Dynamics. 2 hr. PR: A.E. 223. Subsonic and supersonic wind tunnel testing methods and practice. Experiments include the following measurements: pressure distribution on bodies, boundary layer determination, turbulence measurements, force tests, and stability and performance determinations. Corrections for scale and jet boundary effects. Data collection. Data reduction by digital computer. Test design, data analysis, and engineering report preparation. 1 hr. lec., 3 hr. lab.

207. Flight Vehicle Design. 3 hr. PR: A.E. 209. Preliminary design of flight vehicles. Vehicles are designed with regard for performance and stability requirements, considering aerodynamic, weight and balance, structural arrangement, configuration, guidance, and propulsive effects. Layout drawings and calculations are combined in a preliminary design report. 1 hr. lec., 6 hr. lab.

208. Flight Testing. 2 hr. PR: A.E. 209. Flight test theory and practice. Stability and performance determination based on flight test of Cessna 182 airplane. Flight test data reduction practice. 1 hr. lec., 3 hr. lab.

209. Flight Mechanics. 3 hr. PR: A.E. 201. Performance estimation with emphasis on fixed wing aircraft. Fundamental concepts of stability and control of aircraft. 3 hr. lec.

210. Flight Vehicle Structures I. 3 hr. PR: T.A.M. 103. Design of elementary structural forms, truss analysis and use of thin sheet in aerospace vehicles. Deflections by Virtual Work. Least Work and Williot Diagram. 3 hr. lec.

211. Flight Vehicle Structures II. 3 hr. PR: A.E. 210 or equiv. Continuation of A.E. 210. Analysis and design of statically indeterminate structures used in flight vehicles. Emphasis on achieving high strength/weight ratios. 3 hr. lec.

212. Design of Flight Structures I. 3 hr. PR: A.E. 207 and A.E. 211. Structural design of flight vehicle members. Layout and detail design of specified components are required. 1 hr. lec., 6 hr. lab.

213. Experimental Flight Vehicle Structures. 1 hr. PR: A.E. 211. Strength tests of flight vehicle materials, center of gravity determination, static test of components, bending and torsion of shell structures, compression tests of thin-walled structures. 3 hr. lab.

217. Design of Flight Structures II. 3 hr. PR: T.A.M. 103. Analysis and detail design of simple fittings, beams, welded structures, forgings, castings. Methods of production and fabrication. 1 hr. lec., 6 hr. lab.

218. Aerolasticity. 3 hr. PR: A.E. 210. The study of vibrating systems of single degree and multiple degrees of freedom, flutter theory and modes of vibration, torsional divergence and control reversal. 3 hr. lec.

219. Introduction to Research. 1-3 hr. PR: Senior standing and consent. An introduction to the methods of organizing theoretical and experimental research. Formulation of problems, project planning, and research proposal preparation.

220. Research Problems. 2-6 hr. PR: A.E. 219. Performance of the research project as proposed in A.E. 219. Project results are given in written technical reports, with conclusions and recommendations.

223. Fluid Dynamics II. 3 hr. PR: A.E. 201, M.E. 120. Analysis of one dimensional compressible flows including effect of friction and heat transfer. Normal and oblique shock waves. Variable area flow. Introduction to multidimensional flow covering linearized theory and method of characteristics. 3 hr. lec.

224. Flight Vehicle Propulsion. 3 hr. PR: A.E. 223. Application of thermodynamics and gas dynamics to combustion. Turbine cycles with emphasis on turboprop and turbojet propulsion. Ramjets. Rocket propulsion by chemical, nuclear and electrical systems. Propulsion of staged vehicles. 3 hr. lec.

225. Guided Missile Systems. 3 hr. PR: A.E. 223, and/or conc: A.E. 224. Design philosophy according to mission requirements. Preliminary configuration and design concepts. Aerodynamics effects on missiles during launch and flight. Ballistic missile trajectories. Stability determination by analog simulation. Performance determination by digital and analog simulation. Control guidance and propulsion systems. Operational and reliability considerations. 3 hr. lec.

226. Fluid Dynamics IV. 3 hr. PR: A.E. 223. Shock tube theory and applications. Introduction to kinetic theory, the calculation of viscosity and thermal conductivity. Fundamentals of hypersonic flow and the determination of minimum drag bodies. 3 hr. lec.

258. Space Mechanics. 3 hr. PR: Math. 253, T.A.M. 104. An introduction to flight in and beyond the earth's atmosphere by space vehicles. The laws of Kepler and Orbital theory. Energy requirements for satellite and interplanetary travel. Exit from and entry into an atmosphere. 3 hr. rec.

280. Aerospace Problems. 1-3 hr. Upper division and graduate.

299. Thesis. 2-6 hr. PR: Senior standing and consent.

351. Dynamics of Viscous Fluids. 3 hr. PR: A.E. 202. Exact solutions of the Navier-Stokes equations. Laminar boundary layer theory covering similarity solutions and integral methods. Introduction to turbulent flow. 3 hr. lec.

352. Internal Aerodynamics. 3 hr. PR: A.E. 223. Systematic and comprehensive treatment of the flow characteristics of diffusers in general and inlet diffusers in particular. Diffuser with the normal shock; flow process and efficiency in one dimensional analysis. Diffusers with variable geometry and diffusers with external compression. Spike diffusers and subcritical and near critical nonstationary flow process (buzz frequency and intensity). 3 hr. lec.

353. Advanced Fluid Dynamics. 3 hr. PR: A.E. 202. Advanced usage of complex variables, conformal transformation, and stream functions. Extension to three dimensional steady flow. Green's Theorem, Stokes' Theorem, and application of vector notation and methods. Subsonic and supersonic flow. Flow about two and three dimensional bodies by slender body and small-perturbation theory. Similarity rules of high speed flow. Hodograph solutions. 3 hr. lec.

354. Advanced Flight Mechanics. 3 hr. PR: A.E. 209, 223. Dynamic stability. Obtaining flight characteristics of the vehicle from dynamic flight test techniques, such as frequency response, and transient response methods. The problems of automatic control. 3 hr. lec.

355. Gas Dynamics. 3 hr. PR: A.E. 223. Nonsteady gas dynamics and shock tube theory. Applications of shock tubes in aerospace research. Compressible flow theory in the subsonic, transonic, and supersonic regime. 3 hr. lec.

356. Fluid Flow Measurements. 3 hr. PR: A.E. 205, 223. The principles and measurements of: static and dynamic pressures and temperatures, velocity and Mach number, forces. Optical techniques and photography. Design of experiments. Review of selected papers from the literature. 2 hr. lec., 3 hr. lab.

357. Special Problems. 2-4 hr. PR: Consent of department chairman. A course for graduate students in the non-research program. The student will select a specialized field and follow a course of study in that field under the supervision of a counselor.

358. Space Mechanics. 3 hr. PR: Math. 245; A.E. 223, 224. Variational formulation of mechanics. Theory of orbits and trajectories with applications to astronomical problems. Introduction to the space environment of the solar system. 3 hr. lec.

359. Aerodynamic Heating. 3 hr. PR: Math. 253, A.E. 351, or M.E. 330. Extension of the analysis of laminar and turbulent boundary layer theory to include compressibility and real gas effects. Slip flow and free molecular flow. Application to high speed vehicles. 3 hr. lec.

372. Advanced Aeroelasticity. 3 hr. PR: A.E. 218. Deformation of structures under static and dynamic loads, flutter of straight and swept wings, disturbed motion of an elastic model, dynamic response in gusts and landings, the aeroelastic model theory. 3 hr. lec.

373. Dynamic Loads. 3 hr. PR: A.E. 203, 218. Dynamics of a particle, lift distribution during accelerated maneuvers, beam bending and torsion with unsteady loads, empennage loads during dynamic flight conditions, landing impact loads. 3 hr. lec.

374. Materials and Theories of Failure. 3 hr. PR: A.E. 211. Failures in simple stress states, combined stress states; method of fatigue failures, minimum weight structures, evaluation of material to resist design load condition. 3 hr. lec.

375. Advanced Flight Vehicle Structures. 3 hr. PR: A.E. 211. Incomplete tension fields, critical loads, torsional column failure, instability of flat sheets, cylindrical structure, special methods of analysis. 3 hr. lec.

397. Research. 1-15 hr. Advanced research or special investigations on some topic relating to aerospace engineering.

AGRICULTURAL ENGINEERING

Master of Science in Agricultural Engineering

Before being admitted to graduate work in the Department of Agricultural Engineering, the prospective student must be admitted to the Graduate School. Candidates for the M.S. in Agricultural Engineering degree must first satisfy the requirements of the B.S. in Agricultural Engineering degree or its equivalent from a recognized agricultural engineering department. In general, candidates must meet the requirements of the B.S. in Agricultural Engineering degree, but candidates who have an engineering degree other than the B.S. in Agricultural Engineering degree may choose the M.S. in Engineering degree and need not satisfy or remove the requirements for the B.S. in Agricultural Engineering degree.

Thesis. A thesis is required of all candidates for the M.S. in Agricultural Engineering degree or M.S. in Engineering degree. In most cases it will be necessary to take 6 hours of research work, Agricultural Engineering 397. A thesis, however, is not automatically approved after the required number of semester hours of research work has been completed. The candidate may find that completion of the thesis for approval will delay his originally anticipated date of graduation. The major subject, including thesis, must be taken in the Department of Agricultural Engineering. Candidates may specialize in power and field machinery, soil and water conservation, farm structures, or electric power and processing. On satisfactory completion of his thesis and course work, the candidate will be given an examination by his special committee.

Thesis Supervisor. Each student will be assigned a thesis supervisor who will serve as chairman of his graduate committee.

Ag.E.

200. Seminar. 1 hr. PR: Senior or graduate standing.

210. Application of Electricity to Agriculture. II. 3 hr. PR: E.E. 205. Economic application of electric light, heat, and power. 2 hr. rec., 3 hr. lab. Offered in Spring of even years.

220. Agricultural Process Engineering. II. 3 hr. PR: C.E. 115, M.E. 121. Application of the fundamentals of engineering to agricultural engineering processes. 2 hr. rec., 3 hr. lab.

230. Farm Power. I. 4 hr. PR: M.E. 121. Fundamental theories underlying design and operation of internal combustion engines used in agriculture. 3 hr. rec., 3 hr. lab.

240. Applied Hydrology. I. 3 hr. PR: C.E. 115. The study of a hydrologic cycle with emphasis on precipitation and runoff as related to design of hydraulic structures, soil and water conservation, and flood control. 3 hr. rec.

250. Soil and Water Conservation. I. 3 hr. PR: C.E. 115. Engineering principles and practices in conservation, utilization, and management of soil and water resources. 2 hr. rec., 3 hr. lab. Offered in Fall of even years.

320, 321. Special Topics. I, II, S. 1-6 hr. (For the Master's degree. Special Topics ordinarily may count 2 to 4 hr.; maximum credit, 6 hr.)

397. Research. I and II. 1-6 hr.

CHEMICAL ENGINEERING

Master of Science in Chemical Engineering

H. P. Simons, *Program Director*

Students must comply with rules and regulations as outlined in General Requirements for graduate work in the College of Engineering.

A student is admitted to candidacy for the Master of Science in Chemical Engineering degree only on formal written application after he has completed at least 12 credit hours of graduate work in West Virginia University with a grade-point average of at least 3.0

Thesis Supervisor. Each student will be assigned to a thesis supervisor who will serve as chairman of his thesis committee.

Thesis. Normally a thesis is required of all candidates for the M.S.Ch.E. degree, and in practically all cases it will be necessary to take all the 6 semester hours of research work, Ch.E. 397. A thesis, however, is not automatically approved after the required number of semester hours of research work have been completed. In fact, students may find that completion of the thesis will delay their originally anticipated date for graduation.

An acceptably reproduced thesis will be required. This must conform to the general requirements of the Graduate School, as well as to any additional thesis requirements of the Department.

Courses. Admission to the M.S.Ch.E. program presupposes a mathematics background at least through differential equations. The courses required will include Ch.E. 341, 344, 345 and at least two courses selected from the group Ch.E. 302, 304, 306, and 307. Elective courses may include advanced courses in physics, chemistry or mathematics. In general, at least half of the courses should be chosen from the 300 group.

Facilities. The laboratories for Chemical Engineering are well equipped for fundamental study and research in the various phases of heat, momentum and mass transfer, and in rate processes. The control laboratory immediately adjacent is provided with the latest measurement and control instruments and a forty-five amplifier analog computer for process dynamics and systems engineering.

Materials Science Engineering

Master of Science in Engineering

H. V. Fairbanks and P. R. Jones, *Program Co-directors*

Admission. The graduate program in Materials Science Engineering leading to the degree of Master of Science in Engineering is open to any graduate of an accredited engineering curriculum, and is administered by the Department of Chemical Engineering.

Courses. In general, the courses required in this program are Physics 270 and 271, Ch.E. 248, and Mat.E. 250, 255, 260, 265, 269, and 397. A satisfactory thesis is required. It is suggested that electives be chosen from the group Mat.E. 254, 261, 350, 351, 352, 360, Ch.E. 341, Nuc.E. 392, and T.A.M. 200, 203, and 310. Other elective courses may be used by permission of the program co-directors.

Facilities. The specialized facilities for Materials Science Engineering include well equipped laboratories for the complete preparation, examination and testing of materials including ceramics, metals, alloys and synthetics, and for research in these areas. In addition, the laboratory facilities of other departments may be utilized.

Nuclear Engineering

Master of Science in Nuclear Engineering

J. A. Kent, *Program Director*

Students must comply with rules and regulations as outlined in the General Requirements for graduate work in the College of Engineering. Students with a Bachelor of Science in Engineering from an accredited engineering department will be admitted to the program provided that they have a course in differential equations. Students with a Bachelor of Science in one of the physical sciences or in mathematics may be required to take certain undergraduate Engineering courses

prior to admission to the program; the courses are selected to meet the needs of the student on an individual basis. A student is admitted to candidacy for the Master of Science in Nuclear Engineering only on formal written application after he has completed 12 hours of graduate work in the program at West Virginia University with a grade-point average of 3.0 or better.

Courses—A total of 36 hours of course work is required for the Master of Science in Nuclear Engineering. The required courses are: Physics 225, 226, 287, 288; Nuclear Engineering 390, 391, 392, 393, and 397 (maximum of 6 hours). Six credit hours of work are required in related elective subjects.

Thesis—A thesis is normally required of candidates for the M.S.N.E. degree. A maximum of 6 semester hours credit in research (N.E. 397) is usually devoted to thesis preparation. However, the thesis is not automatically approved after the required number of semester hours of research work have been completed. The thesis must conform with the general requirements of the Graduate School.

Final Examination—The candidate for the M.S.N.E. degree shall submit to an oral or written examination by his advisory and examining committee. The examination may cover all course material and the thesis.

The Nuclear Engineering curriculum is approved for participation in the Atomic Energy Commission Special Fellowship Program, and the program is administered by the Department of Chemical Engineering.

Facilities—The specialized facilities for Nuclear Engineering include a swimming pool reactor, a subcritical reactor, electronic nuclear reactor simulator, graphite sigma pile, 10,000 curie and 1,000 curie cobalt-60 irradiators, and a modern radioisotopes laboratory for instruction and research. The various departments in the College of Engineering are also well equipped for a variety of research projects which are applicable to the field of nuclear technology.

The Degree of Doctor of Philosophy

H. P. Simons, *Program Director*

Candidates for the degree of Doctor of Philosophy are urged to complete the requirements for the M.S.Ch.E., M.S.E., or the M.S.N.E. degree. In addition to the general requirements of the Graduate School, candidates are required to take the following courses: Ch.E. 302, 304, 306, 307, 323, 324, 341, 344, and 345.

The research work for a doctoral dissertation should show a high order of originality on the part of the student and must offer an original contribution to the field of engineering science. It must have good literary form and style, must give a thorough survey of the prior art with acceptable standards of documentation. Upon completion of the dissertation, the candidate is required to take a final oral examination. This examination is designed to bring out the candidate's logic, critical ability and reasoning power, and is based upon the field covered by the dissertation.

Chemical Engineering

Ch.E.

210. Process Engineering. 3 hr. PR: Ch.E. 208. Process equipment calculations for unsteady state. Determination of maximum and minimum process conditions. Economics of processing methods. 3 hr. rec.

224. Process Development. 3 hr. PR: Chem. 238 and 261, Ch.E. 202, 206, and 243. Development of process systems from the unit operations-unit process concept. Use of thermodynamics and kinetics in the evaluation of system requirements and performance. 3 hr. rec.

242. Chemical Engineering Thermodynamics and Kinetics. 3 hr. PR: Chem. 261. Material and energy balances; internal energy levels; statistical distributions and statistical evaluation of thermodynamic functions; empirical evaluation of thermodynamic functions; second law of thermodynamics; thermodynamic properties of solutions and solid phases; chemical and physical equilibria. Kinetics of simple and complex chemical reactions; development of rate equations. Kinetics of vapor phase-catalytic reactions; development of rate equations and mechanisms of reactions; back mixing. 3 hr. rec.

243. Chemical Engineering Thermodynamics and Kinetics. 3 hr. Continuation of Ch.E. 242. 3 hr. rec.

248. Statistical Design of Experiments. 2 hr. PR: Math. 253 or consent. Development of the principles of factorial design based on selected observations. Other design procedures such as confounding, composite design and evolutionary operations, with applications to chemical engineering and related fields. Evaluation of the factors affecting systems, development of factor interrelations and the nature of interactions. Determination of optimum conditions. Computing technics. 2 hr. rec.

272. Chemical Engineering Design. 3 hr. PR: Ch.E. 207, T.A.M. 102, and Econ. 2. Design of process equipment from economic, chemical and engineering considerations. Study of plant location and layout. 2 hr. rec., 3 hr. lab.

273. Chemical Engineering Design. 3 hr. Continuation of Ch.E. 272. 2 hr. rec., 3 hr. lab.

280. Chemical Engineering Problems. 1-6 hr. For junior, senior and graduate students.

283. Process Dynamics. 3 hr. PR: Math. 253, Ch.E. 207. Introduction to automatic control and control loop concepts, measurement of variables, dynamic properties of instruments, process response, discussion of controller types, derivation of equations for first and second order control systems, derivation of equations for first and second order process, transient analysis of process and control systems, use of analogue computer for process simulation and solution of differential equations. 3 hr. rec.

284. Industrial Instrumentation and Control. 3 hr. PR: Math. 108. Discussion of process characteristics, theory and application of measuring means. Theory, modes and application of automatic control. Selection and characteristics of final control elements. 3 hr. rec.

297. Thesis. 2-5 hr. A problem in chemical engineering or industrial chemistry is selected for investigation. A carefully prepared report is required. Open only to qualified seniors. 6-15 hr. lab.

300. Seminar. 1-6 hr. Hours to be arranged.

302. Advanced Heat Transfer. 2-5 hr. PR: Ch.E. 207, 243, Math. 253. Theory of steady and transient conduction, radiation heat transfer, dimensional analysis and analogy, natural convection, forced convection, heating and cooling inside and outside tubes, finned tubes and compact heat exchangers, packed and fluidized system heat transfer, heat transfer in condensing vapor, heat transfer in boiling liquids and evaporation, high velocity flow heat transmission, application to process heat transfer and design. 3 hr. rec., 0-6 hr. lab.

304. Advanced Mass Transfer. 2-5 hr. PR: Ch.E. 207, 243, Math. 253. Theory of diffusion, interphase mass transfer theory, simultaneous mass and heat transfer, principles of design, equipment survey, mechanical operations, mass transfer performance, scale-up practices, mass transfer in solid-gas and solid-solid phases, liquid-liquid extraction. 3 hr. rec., 0-6 hr. lab.

306. Advanced Fluid Dynamics. 2-5 hr. PR: Ch.E. 207, 243, Math. 253. Vector and tensor analysis, differential equations of fluid flow, flow of nonviscous fluid, laminar flow, turbulent flow, analogy between fluid momentum, mass and heat transfer, dimensional analysis, the laminar sublayer, flow of fluid past immersed bodies, fluid dynamics of particle suspensions, flow of fluids through porous media, non-Newtonian fluid flow. 3 hr. rec., 0-6 hr. lab.

307. Advanced Distillation. 2-5 hr. PR: Ch.E. 207 or Chem. 261. Advanced study of vaporization principles of separation of liquid mixtures, steam, batch, continuous, azeotropic, extractive, and molecular distillation. 3 hr. rec., 0-6 hr. lab.

323, 324. Advanced Process Development. 3 hr. PR: Chem. 238 and 261, Ch.E. 202, 206, 243, and 273. Use of extended and generalized unit process and unit operation concepts; specialized synthetic methods; reaction mechan-

isms and their effects on equipment design and performance; study of properties, their evaluation, prediction and marketability; industrial toxicology and plant safety. 3 hr. rec.

341. Mathematical Methods in Chemical Engineering. 3 hr. PR: Math. 253. Emphasis is placed upon the formulation of the differential and difference equations, both ordinary and partial, govering chemical engineering operations. Analytic and numerical techniques used for their solutions include transform methods. 3 hr. rec.

344. Advanced Chemical Engineering Thermodynamics. 3 hr. PR: Ch.E. 243. Review of thermodynamic transformations, use of Jacobians; advanced applications to chemical and physical equilibria; development and applications of phase rule; equilibria diagrams for nonideal systems; determination and use of activity coefficients; methods of estimating thermodynamic functions; introduction to statistical mechanics. 3 hr. rec.

345. Advanced Chemical Engineering Kinetics. 3 hr. PR: Ch.E. 243. Applications of chemical kinetics to industrial reactor design; review of physical chemical principles; theories of reactions; design of batch and flow reactors; theories of catalysis; reactor mechanisms; data interpretation; applications to design of catalytic reactors; effects of diffusion on catalytic reactions. 3 hr. rec.

372. Advanced Chemical Engineering Design. S. 2-5 hr. PR: Ch.E. 273. Critical discussion of and practice in equipment-design methods. 2 hr. rec., 0-9 hr. lab.

383. Advanced Systems Engineering. 3 hr. PR: Ch.E. 283, 284. Control systems and the feed-back concept, transfer functions and mathematical analysis of dynamic equations, transient analysis and stability of control systems, frequency response of control system, thermal process dynamics, mass transfer dynamics, chemical process dynamics, use of analogue computer for study of system behavior, nonlinear systems and adaptive control, random response and filtering of noise. 3 hr. rec.

397. Research. 1-15 hr. PR: Ch.E. 207, 212. Suitable problem in chemical engineering, metallurgy, nucleonics, ceramics, or fuels is selected for investigation.

Materials Science Engineering

Mat.E.

250. Engineering Materials Science. 3 hr. PR: Physics 112. Includes a study of the internal structures of metals, ceramics, and organic materials and the dependence of properties upon these structures. Also included is the behavior of materials under conditions involving mechanical stresses, thermal reactions, corrosion, electromagnetic fields and radiation. 3 hr. rec.

254. Principles of Metallurgical Engineering. 3 hr. PR: Physics 112. Includes the theory and physical principles involved in the production of metals from their ores. 3 hr. rec.

*255. Synthetic Materials. 3 hr. PR: Physics 112. Properties, uses and methods of production of synthetic materials such as plastics, elastomers, laminates, lubricants and miscellaneous materials of construction. 3 hr. rec.

260. Physical Ceramics. 3 hr. PR: Physics 112. The electronic and crystalline structure of ceramic materials; thermodynamics and kinetics of ceramic systems; the mechanical, chemical, electrical, thermal, and optical properties of ceramic materials and the factors affecting them; processing and utilization of ceramic materials.

261. Principles of Ceramic Engineering. 3 hr. PR: Mat.E. 260. Identification of the factors affecting the properties of ceramic systems through applica-

*Courses may be taken as undergraduate work by students in Colleges and Schools other than the College of Engineering.

tion of factorial design; the development of empirical equations showing the relationships between the factors; development of optimum conditions. 3 hr. rec.

*265. Materials Science Laboratory. 2 hr. PR: Mat.E. 250, 255, 260. Preparation and pretreatment of engineering materials for photomicrography and physical inspection. 6 hr. lab.

*269. X-Ray Diffraction. 2 hr. The theory of x-ray diffraction and application to the analysis of crystalline materials, using the powder camera and x-ray diffractometer. Open to students in geology, chemistry, engineering, and related fields with permission of the instructor. 1 hr. rec., 3 hr. lab.

350. Advanced Physical Metallurgy. 3 hr. PR: Mat.E. 250. Includes the principles of crystallization, plastic deformation, precipitation hardening, and the transformation of austenite. 3 hr. rec.

351. Metallography Laboratory. 3 hr. PR: Mat.E. 250. Includes radiography, photomicrography, recrystallization, and heat treatment of ferrous and nonferrous metals and alloys. 1 hr. rec., 6 hr. lab.

352. Alloys. 3 hr. PR: Mat.E. 250. Includes the use of the phase rule, binary and ternary constitutional diagrams, and fundamental principles involved in the formation of alloys. 3 hr. rec.

360. Advanced Physical Ceramics. 3 hr. PR: Mat.E. 261. The mechanical, chemical, thermal, optical, electrical, and magnetic behavior of ceramic materials, together with their evaluation and prediction. 3 hr. rec.

361. Ceramics Laboratory. 1 hr. PR: Mat.E. 360. Design of ceramic bodies based on the theoretical behavior; preparation, processing, and measurement of physical properties. 3 hr. lab.

397. Research. 1-15 hr.

Nuclear Engineering

Nuc.E.

290. Introductory Nuclear Engineering. 3 hr. PR: Physics 112. Includes elementary nuclear physics necessary for understanding nuclear engineering. Design and operation of nuclear reactors, shielding, instrumentation, health physics, fuel cycles, uses of radioactive isotopes, nuclear propulsion. 3 hr. rec.

380. Advanced Independent Study. 1-3 hr. Special studies in fuel reprocessing, shielding, reactor technology, and related areas.

390. Analysis of Nuclear Energy Systems. 3 hr. PR or conc: Physics 225 or equiv., and Physics 287 or equiv. Probability concepts and nuclear cross sections. Multiplication constant and neutron flux. Diffusion theory. Homogeneous reactors: one group theory; multigroup theory. Heterogeneous reactors. Reflected reactors. Reactor kinetics. Control rod theory. Special considerations in analysis of hydrogeneous systems. 3 hr. rec.

391. Principles of Nuclear Reactor Engineering. 3 hr. PR: Nuc.E. 390. Thermal analysis of reactor systems. Shielding. Fuel element design. Reactor poisons. Instrumentation. Economics of nuclear systems. Radiation protection. Legal aspects. Radioactive waste disposal. 3 hr. rec.

392. Interaction of Radiation and Matter. 3 hr. PR or conc: Physics 225. Radiation damage models, effects of nuclear radiations on reactor components and other materials, experimental techniques. Industrial applications: process control, polymerization, sterilization, pasteurization. 3 hr. rec.

393. Nuclear Laboratory. 3 hr. PR or conc: Nuc.E. 390 or equiv. Techniques of radiation measurements. Determination of neutron properties; diffusion length, albedo, etc. Exponential reactor parameters. Reactor simulation. Experiments with swimming pool reactor and cobalt-60 radiation facility. Dosimetry. 1 hr. rec., 6 hr. lab.

397. Research. 1-15 hr.

CIVIL ENGINEERING

Master of Science in Civil Engineering

Students must comply with rules and regulations as outlined in General Requirements for graduate work in the College of Engineering.

Courses. No rigid curriculum is prescribed for the degree of Master of Science in Civil Engineering. Graduate level work in mathematics and mechanics is customary and at least 15 hours should be selected from civil engineering courses numbered 300 or above.

Thesis. A thesis is normally required of candidates for the M.S.C.E. degree. The maximum of 6 semester hours credit in research (C.E. 397) is usually devoted to thesis preparation. However, the thesis is not automatically approved after the required number of semester hours of research work have been completed. The thesis must conform with the general requirements of the Graduate School and with any additional requirements established by the Department.

At the discretion of the student's advisory committee a non-thesis program may be established in which either a comprehensive problem or additional course work is substituted for the thesis.

Final Examination. The candidate for the M.S.C.E. degree shall be given an oral or written examination by his advisory and examining committee. The examination shall cover all course material and the thesis, if one is required.

The Degree of Doctor of Philosophy

A candidate for the degree of Doctor of Philosophy must comply with the rules and regulations as outlined in General Requirements for graduate work in the College of Engineering. A program designed to meet the needs and objectives of each student will be developed in consultation with the student's committee.

The research work for the doctoral dissertation must show a high degree of originality on the part of the student and must constitute an orginal contribution to the art and science of civil engineering. The dissertation must have good literary form and style and must present a thorough review of the prior study in the subject with acceptable standards of documentation. The candidate is required to take a final oral examination upon completion of the dissertation. This examination is designed to permit the candidate to demonstrate his ability to present and defend his work orally in a logical manner.

C.E.

210. Photogrammetry. 3 hr. PR: C.E. 102 or 104. Geometry and interpretation of the aerial photograph; flight planning, radial-line control; principles of stereoscopy; plotting instruments. 2 hr. rec., 3 hr. lab.

211. Geodesy. 3 hr. PR: C.E. 102 or 104 and Math. 116. Precise base line measurements, triangulation and leveling, geodetic astronomy; figure of the earth, map projections; rectangular coordinate systems; least squares adjustment; gravity. 3 hr. rec.

221. Engineering Hydraulics. 3 hr. PR: C.E. 115 or consent. Fundamental principles of flow, similitude, flow measurement, water hammer and surging, channel transitions, gradually varied flow, wave motion and sediment transportation. Design of various elements of hydraulic structures. 3 hr. rec.

231. Concrete and Aggregates. 3 hr. PR: C.E. 131, 179, T.A.M. 103. Considerations and methods for the design of concrete mixes. Effect of air entraining agents and other additives. Studies of the influence of aggregate properties on the design and performance of concrete mixtures. An analysis of the methods of test commonly used for concrete and aggregates and the significance of these tests. 3 hr. rec.

232. Principles of Transportation Engineering. 3 hr. PR: C.E. 131 or consent. A basic approach to the problem of integrated transportation systems from the standpoint of assembly, haul, and distribution means. Includes an

analysis of the characteristics of the transport equipment and traveled way. Power requirements, speed, stopping, capacity, costs, economics of location and route selection will be discussed. Future technological developments and innovations will be considered. 3 hr. rec.

236. Highway Materials Laboratory. 3 hr. PR: T.A.M. 103. Testing of highway materials for compliance with specifications in the State Road Commission's Materials Testing Laboratory. 1 hr. rec., 6 hr. lab.

251. Public Health Engineering. 3 hr. PR: C.E. 145. The engineering aspects involved in the control of the environment for the protection of the health and the promotion of the comfort of man. Discussions will include communicable disease control, milk and food sanitation, air pollution, refuse disposal, industrial hygiene, and radiological health hazards. 3 hr. rec.

252. Water Resources Engineering. 3 hr. PR: C.E. 115. The design of water-resource systems. The interrelationship between economic objectives, engineering analysis, and governmental agencies. 3 hr. rec.

260. Structural Analysis II. 3 hr. PR: C.E. 160. An introduction to the fundamental theory of statically indeterminate structures. General theory of continuity and iterative and energy methods applied to the analysis of indeterminate beams and frames. 3 hr. rec.

261. Statically Indeterminate Structures. 3 hr. PR: C.E. 260. Advanced topics in indeterminate structural analysis for trusses and nonprismatic members. 3 hr. rec.

270. Structural Design I. 3 hr. PR or conc: C.E. 260. Theory and design of reinforced concrete members. Design considerations for concrete bridges and buildings. 2 hr. rec., 3 hr. lab.

271. Structural Design II. 3 hr. PR or conc.: C.E. 260. Design of steel bridge and building structures. Welded, riveted, and bolted connections; simple and moment-resistant connections; cost estimates. 2 hr. rec., 3 hr. lab.

272. Plastic Design of Steel Structures. 3 hr. PR: C.E. 260 or consent. The fundamental concepts of the plasticity of steel. Analysis of structures for ultimate load. The influence of axial forces, shear forces, and local buckling on the plastic moment. Study of structural connections and deflections. Steel structure design. 3 hr. rec.

273. Prestressed Concrete. 3 hr. PR: C.E. 270. The analysis and design of determinate and indeterminate prestressed beams and frames. 3 hr. rec.

275. Reinforced Concrete. 3 hr. PR: C.E. 160, 170. Theory and design of slabs, beams, columns, footings, retaining walls, and concrete buildings. Introduction to principles of prestressed concrete. 2 hr. rec., 3 hr. lab.

280. Soil Mechanics. 3 hr. PR: C.E. 115, T.A.M. 101. Origins and distribution of soils, classification of soils, fundamental soil properties and stresses in soils. Subsurface exploration. Introduction to foundations design and the design and construction of earth structures. 2 hr. rec., 3 hr. lab.

281. Foundations Engineering. 3 hr. PR: C.E. 131, 280. Soils exploration and the design and analysis of engineering foundations. Particular emphasis on earth pressures and the design of retaining walls, studies of bracing systems and the elements of shallow and deep foundations for bridges and buildings. Movement of water through soil structures and control of water in excavations. 3 hr. rec.

290. Civil Engineering Problems. 1-4 hr. For junior, senior, and graduate students.

315. Advanced Fluid Mechanics. 3 hr. PR: C.E. 115. Compressible and noncompressible flow, flow with friction and heat transfer, boundary layer flow, fluid machines, unsteady flow and fluid vibrations. 3 hr. rec.

321. Hydraulic Structures. 3 hr. PR: C.E. 221 or consent. The hydraulic analysis and design of engineering structures such as reservoirs, dams, spillways, gates, and outlet works. The study of hydraulic machinery, irrigation, hydroelectric power, drainage and flood control. 3 hr. rec.

330. Bituminous Materials and Mixtures. 3 hr. PR: C.E. 131, 179. Manufacture and testing of bituminous materials. Significance of tests and specifications of bituminous materials. Principles of the design of bituminous mixtures, including methods of test and the influence of aggregate, temperature, and other variables upon design for stability and durability. Production of bituminous mixtures and construction practice in utilizing these mixtures. 2 hr. rec., 3 hr. lab.

331. Pavement Design. 3 hr. PR: C.E. 131, 280. Effects of traffic, soil, and loads on the design of pavement. Consideration of drainage and climate. Design of bases and sub-bases. Methods of design of flexible and rigid pavements. Performance of pavement surveys. 2 hr. rec., 3 hr. lab.

332. Highway Economics and Administration. 3 hr. PR: Consent. Study of the methods of financing highways including federal participation. Consideration of the means of establishing allocation of highway cost and determination of economic justification of routes. Analysis of highway administrative organizations. 3 hr. rec.

333. Geometric Design of Highways. 3 hr. PR: Consent. The theory and practice of the geometric design of modern highways. Horizontal and vertical alignment, cross-slope, design speed, sight distances, interchanges, and intersections are discussed. Critical analysis of design specifications. 2 hr. rec., 3 hr. lab.

334. Urban Problems. 3 hr. PR: Consent. The study of the particular problems of transportation in the urban area as they relate to the general development of the city. Emphasis is on the role of the engineer in the planning for urban transportation and the relationship of the engineer to the city planner and to the city administration. 3 hr. rec.

335. Surface and Subsurface Drainage. 3 hr. PR: Consent. The study of the nature and requirements of drainage studies and drainage design as they pertain to transportation facilities. Emphasis is on the theory of drainage design and a critical analysis of drainage practices. 3 hr. rec.

336. Highway Planning I. 3 hr. PR: Consent. Analysis of planning programs and methods including highway needs studies, priority rating systems, and programming methods. Consideration of traffic assignment and forecasting techniques. Devoted primarily to rural route problems. Case history method of study utilized. 3 hr. rec.

337. Highway Planning II. 3 hr. PR: C.E. 336. Continuation of C.E. 336 with special attention to urban locations and planning. 3 hr. rec.

338. Highway Laws. 3 hr. PR: Consent. The analysis of existing highway laws with emphasis on those aspects particularly related to planning functions such as reservation of rights-of-way, access control, eminent domain, systems classification, and the basis for the existence and operation of various planning agencies. 3 hr. rec.

339. Traffic Engineering Characteristics. 3 hr. PR: C.E. 131 or consent. The analysis of the basic characteristics of drivers, vehicles, and roadway that affect the performance of road systems. Studies of volumes, speeds, delays, intersections, interchanges, capacity, and accidents will be considered. The techniques of traffic engineering measurements, investigations and data analysis, including laboratory practice, will be included. 2 hr. rec., 3 hr. lab.

340. Traffic Engineering Operations. 3 hr. PR: C.E. 339. The theory and practice of the application of traffic engineering regulations, traffic flow theory, the design and use of traffic control devices and signal systems. Traffic administration and parking control will be discussed. 3 hr. lec.

345. Properties of Air Pollutants. 3 hr. PR: Consent. Physical, chemical, biological, and social behavioral properties of dusts, droplets, and gases in the atmosphere. Air pollutant sampling and analysis. The planning and operation of air pollution surveys. 2 hr. rec., 3 hr. lab.

346. Air Pollution Control Engineering. 3 hr. PR: C.E. 345 or consent. Study of the engineering alternatives in achieving various degrees of air pollution control. Factors that are considered in selection and specification of dust and gas collectors and convertors for various types of operations, and the use of alternate process methods and process materials. 2 hr. rec., 3 hr. lab.

347. Air Pollution Control Standards. 3 hr. PR: C.E. 346 or consent. Comparative study of technical, economical, and social factors used in developing and establishing air pollution standards, criteria, and control limitations. Relationships between process design specifications, pollutant emission limitations, ambient air pollution effects on people and objects, air quality standards and emission performance limitations. 2 hr. rec., 3 hr. lab.

348. Air Pollution Control Programs. 3 hr. PR: C.E. 346 or consent. Examination of air pollution control programs of industries and government. Rationales and patterns of organization structure and operating administrative factors, including intra-office and inter-office and other group relationships. Significance of relationships with planning fire prevention, water pollution control, building inspection, and economic development agencies. 3 hr. rec.

349. Solid Waste Disposal. 3 hr. PR: Consent. Study of traditional patterns and problems of solid waste storage, transport, and disposal. Examination of various engineering alternatives with appropriate consideration for air pollution control, water pollution control, and land reclamation. Analytical approaches to recovery and reuse of materials. 2 hr. rec., 3 hr. lab.

350. Sanitary Chemistry and Biology. 3 hr. PR: C.E. 145, Bact. 248, or consent. Study of the physical and chemical properties of water. Theory and methods of chemical analysis of water, sewage, and industrial wastes. Biological aspects of stream pollution problems. 2 hr. rec., 3 hr. lab.

352. Water Treatment Theory. 3 hr. PR: C.E. 350. Theory of the various procedures and techniques utilized in the treatment of water for municipal and industrial use. Review of water quality criteria. 2 hr. rec., 3 hr. lab.

353. Sewage and Industrial Waste Treatment. 3 hr. PR: C.E. 350. Theory and methods of sewage treatment. Chemical, biochemical, and physical factors related to waste treatment. Characteristics of industrial wastes and special considerations necessary for their disposal. 2 hr. rec., 3 hr. lab.

357. Hydraulics of Sanitary Engineering Works. 3 hr. PR: C.E. 221. The application of the techniques of population growth estimation, rainfall and runoff analysis, food flow, and ground water data to the design of sanitary works. Design of water distribution systems and sewerage systems. 2 hr. rec., 3 hr. lab.

358. Design of Sanitary Works. 3 hr. PR: C.E. 221. The investigation of water supply and waste water disposal problems. The design of water purification and waste water treatment facilities. 2 hr. rec., 3 hr. lab.

359. Basic Radiological Health. 3 hr. PR: Consent. Fundamental theory and terminology. Environmental and occupational hazards in the nuclear field. Laboratory measurements of radioactivity. 2 hr. rec., 3 hr. lab.

360. Statically Indeterminate Structures. 3 hr. PR: C.E. 260 or consent. General theory of continuity, iterative, and classical methods of analysis of skeleton structures with emphasis of the influence coefficient method. 3 hr. rec.

361. Bridge Engineering. 3 hr. PR: C.E. 360. Statically indeterminate trusses; continuous trusses; steel and concrete arches; long-span and suspension bridges; secondary stresses. 3 hr. rec.

362. Numerical Methods of Structural Analysis. 3 hr. PR: C.E. 261 or 360. Methods of successive approximations and numerical procedures for the solution of structural problems. Application of these procedures to the analysis of bridges and buildings. 3 hr. rec.

363. Introductions to Structural Dynamics. 3 hr. PR: Math. 240, C.E. 261 or 360. General theory for dynamic response of systems having one or several degrees of freedom. Emphasis on the application of dynamic response theory to structural design. 3 hr. rec.

375. Reinforced Concrete Design. 3 hr. PR: C.E 270. Theories of action of beams, slabs, and columns of reinforced concrete; review of standard codes and specifications and their influence on design. 3 hr. rec.

376. Behavior of Reinforced Concrete Members. 3 hr. PR: C.E. 270 or consent. Studies of the actual behavior and strength of reinforced concrete members by critically reviewing experimental and analytical investigations. Beams subjected to pure flexure, columns subjected to axial compression; combined flexure and compression; combined flexure, shear, and bond. 3 hr. rec.

377. Behavior of Reinforced Concrete Structures. 3 hr. PR: C.E. 376. Continuation of C.E. 376. Studies of behavior and strength of statistically indeterminate reinforced concrete structures. Comparison with reinforced concrete codes and specifications. 3 hr. rec.

378. Thin Shell Roof Structures I. 3 hr. PR: Math. 253, C.E. 261 or consent. Emphasis on the development and solution of the fundamental elastic equations for barrel vault roofs using matrix algebra. Study of the effects of edge members upon the strength and stiffness of barrel vault roofs. Design of simple shell structures. 3 hr. rec.

379. Thin Shell Roof Structures II. 3 hr. PR: C.E. 378 or consent. A continuation of C.E. 378. Analysis of multiple cylindrical shells using the theory of elasticity and matrix algebra. Ultimate load and variational methods in shell analysis. Design and analysis of doubly curved shells. 3 hr. rec.

380. Soil Mechanics. 2-6 hr. PR: Consent. Advanced study of soil structure, shear strength, consolidation, and earth pressures. Sand drains, stress distribution, slope stability, seepage.

381. Soil Testing. 3 hr. PR: C.E. 280. The testing of soils for engineering purposes including classification, strength, consolidation, compaction, permeability, and special tests. Critical review of test methods and the analysis of test results. Organization and operation of a soils testing laboratory. 1 hr. rec., 6 hr. lab.

382. Foundations and Earthwork Design. 3 hr. PR: C.E. 380. Planning and performance of subsurface exploration. Principles of the design and analysis of retaining walls, pile foundations, bulkheads, and shallow and deep foundations. Considerations in the design of embankments and slopes. Problems of soft ground and rock construction. 3 hr. rec.

390. Advanced Design Problems. 2-6 hr. A design or investigation of any assigned problem related to civil engineering.

395. Seminar. 1-2 hr. PR: Consent. Studies and group discussions of structural, fluid mechanics, surveying, transportation, and sanitary problems.

397. Research. 1-15 hr. per sem. Original report or investigation on some topic in the civil engineering field.

ELECTRICAL ENGINEERING

Master of Science in Electrical Engineering

Students must comply with rules and regulations as outlined in General Requirements for graduate work in the College of Engineering.

Thesis. Normally a thesis is required of all candidates for the degree of Master of Science in Electrical Engineering. Approval by the Advisory and Examining Committee is necessary before the thesis will be accepted. The thesis must be presented in a form that conforms to general requirements of the Graduate School, and in addition should conform to additional thesis requirements of the department.

Whether or not a thesis is required shall be determined by the department and shall be recorded in the student's file as a part of his planned program.

Final Examination. Each candidate for the Master's degree shall pass a final examination administered by his Advisory and Examining Committee. This examination may be written or oral or both and shall cover the course material. If a thesis has been required, the examination shall also cover the thesis.

Courses. The following grouping of courses is given as a guide for selecting a graduate program leading to the degree of Master of Science in Electrical Engineering.

Group I. *Required of all candidates*	*Hr.*
E.E. 300. Seminar (2 semesters)	1
E.E. 325. Advanced Linear Circuit Analysis	3
E.E. 326. Advanced Electric and Magnetic Field Theory	3

Group II. *Major (Minimum of 6 hours of electrical engineering courses in the 300 series other than Group I)*

Group III. *Minor (6 hours required)*

Approved sequence of Mathematics or Physics.

In order to meet the minimum requirements for the degree of Master of Science in Electrical Engineering additional courses may be taken from the following, subject to the approval of the student's Advisory and Examining Committee:

1. Courses from Groups II and III.
2. Electrical Engineering courses in the 200 series which are not required for the degree of Bachelor of Science in Electrical Engineering at West Virginia University.
3. Physics courses in the 200 or 300 series.
4. Courses in other departments of the College of Engineering in the 200 and 300 series.

The Degree of Doctor of Philosophy

A candidate for the degree of Doctor of Philosophy must comply with all requirements of the Graduate School and with the rules and regulations as outlined in "A Guide to the Graduate Program in Engineering" for graduate work in the College of Engineering. A program designed to meet the needs and objectives of each student will be developed in consultation with the student's committee. In addition, the following will be required by the department:

1. In general, requirements for the M.S.E.E. degree must be fulfilled. These requirements are outlined above.
2. Candidates for the Ph.D. degree who have been admitted with an M.S. degree from other institutions must satisfy the departmental course requirements for the M.S.E.E. degree.
3. A Ph.D. degree candidate will normally be required to take a minimum of six hours in his minor field. A minimum of three of these hours must be at the 300 level.

E.E.

200. Seminar. (credit) PR: Senior standing. Special material and projects.

205. Electrical Fundamentals. 4 hr. PR: E.E. 105. Fundamentals and operating characteristics of electrical machines and transformers. Electron tube, phototube, and transistor characteristics. Electronic circuits. (Not open to electrical engineering students.) 3 hr. rec., 3 hr. lab.

225. Electric Circuits. 4 hr. PR: E.E. 125. Distributed circuits (transmission lines) steady state analysis of distributed circuits, simulation of distributed circuits by equivalent lumped parameter circuits. Interpretation of trans-

mission line as general four terminal network (A B C D constants), matrix methods of combination of four terminal networks, introduction of "modern" network analysis. 3 hr. rec., 3 hr. lab.

226. Electromagnetic Fields. 3 hr. PR: E.E. 126. Plane waves in dielectric media; plane waves in conducting media; transmission lines; wave guides; antennas. 3 hr. rec.

232. Electromechanical Devices. 4 hr. PR: E.E. 125, 126. Fundamentals of electromechanical energy conversion. Transformers and rotating machines. 3 hr. rec., 3 hr. lab.

233. Electromechanical Devices. 4 hr. PR: E.E. 232. Analysis of machine-performance by the principles of electromechanical energy conversion. 3 hr. rec., 3 hr. lab.

235. Electrical Machinery. 3 hr. PR: E.E. 233 or consent. Synchronous machines, windings, calculation of emf and mmf; mmf space functions. Potier diagram, ASA regulation, 2-reactance diagrams. Multiple-winding transformers and auto transformers. 2 hr. rec., 3 hr. lab.

236. Electrical Machinery. 3 hr. PR: E.E. 233 or consent. Commutation theory of machines, d-c and a-c multiple-winding and special purpose machines; multiple machine systems. 2 hr. rec., 3 hr. lab.

252. Electronics. 3 hr. PR: E.E. 152. Analysis of power amplifiers, tuned amplifiers, oscillators, modulators, demodulators, and wave-shaping circuits. 3 hr. rec.

253. Physical Electronics. 3 hr. PR: E.E. 252. A study of the physical principles of electrical conduction and the application of these principles to electronic conduction in solids, electron emission, and conduction in vacuum and gas. 3 hr. rec.

257. Transistor Circuits. 3 hr. PR: E.E. 252 or consent. A study of the general operating properties of the transistor as a circuit element. 3 hr. rec.

261. Networks and Filters. 3 hr. PR: E.E. 225 or consent. Analysis and synthesis of networks and filters. 3 hr. rec.

262. Electronic and Communications Laboratory. 2 hr. PR: E.E. 252 or consent. A study of tuned amplifiers, oscillators, modulators, wave-shaping circuits, transmission line characteristics, and special topics. 6 hr. lab.

264. Communications Engineering. 3 hr. PR: E.E. 252 or consent. A study of communications systems, or systems used to transmit information. The underlying principles of modern information transmission systems are stressed. Emphasis is placed upon the fundamental role of system bandwidth and noise in limiting the transmission of information. 3 hr. rec.

270. Engineering Analysis and Design. 3 hr. PR: E.E. 232, 252. Formulation and application of the method of engineering analysis based upon fundamental physical laws, mathematics, and practical engineering considerations. Emphasis is placed on the professional approach to the analysis of engineering problems. 3 hr. rec.

271. Theory of Digital Computers. 3 hr. PR: E.E. 150 or consent. An introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean algebra and its application to computer design and sequencing of basic arithmetic processes in a computer. 3 hr. rec.

272. Digital Computer Logic Design. 3 hr. PR: Math. 253 or consent. An introduction to digital computing machines. The algebra, geometry and topology of binary logic. The design of combinational logic units and elementary sequential circuits. 3 hr. rec.

275. Pulse Techniques. 3 hr. PR: E.E. 225, 252. An introduction to the response of electrical networks to non-sinusoidal inputs, the analysis of active networks with large signals and the circuits and techniques used in pulse and digital equipment. 3 hr. rec.

280. Electrical Problems. 1-3 hr. For junior, senior, and graduate students.

281. Electrical Power Systems. 3 hr. PR: E.E. 226 or consent. Polyphase transformation with three-phase and with single-phase transformers. Principles of circuit protection and relaying. Principles of grounding. Introduction to symmetrical components. 2 hr. rec., 3 hr. lab.

282. Symmetrical Components. 3 hr. PR: E.E. 226 or consent. An application of the methods of symmetrical phase components in calculating currents in systems under various types of unbalanced conditions. 3 hr. rec.

285. Electric-Power Transmission and Distribution. 3 hr. PR: E.E. 226. A study of circle diagrams applied to the various problems of power transmission; phase modifier applications and an introduction to power system stability. 3 hr. rec.

286. Fundamentals of Servomechanisms. 3 hr. PR: E.E. 225. Fundamental analysis of the servomechanisms and automatic control devices. 3 hr. rec.

287. Industrial Electronics and Controls. 3 hr. PR: Consent. A study of electronic and magnetic control equipment and its application in industry. 3 hr. rec.

288. Antennas. 3 hr. PR: E.E. 264 or consent. Analysis and design of antenna systems. 3 hr. rec.

293. Analogue Computers. 3 hr. PR: Math. 253. A study of the theory and operation of analogue computers. Amplitude scaling and time scaling on the analogue computer and application of the analogue computer to the solution of differential equations. 3 hr. rec.

299. Ultra-High Frequency Technology. 3 hr. PR: E.E. 264 or consent. Study of special problems encountered at high and ultra-high frequencies. 3 hr. rec.

300. Seminar. 1-3 hr. PR: Consent. Discussion of research in electrical engineering and special problems.

301. Electrical Power Systems. 3 hr. PR: E.E. 281 or consent. Load flow problems. Transient and steady state stability of systems. The principles of the application of network analyzers and other computing devices to the solution of power system problems. 3 hr. rec.

310. Switching Circuit Theory I. 3 hr. PR: E.E. 271 or consent. This course together with E.E. 311 provides the basis for mathematical switching theory. Boolean algebra and related systems are developed from the postulational approach and applications to the theory of computers and automata are studied in detail. The emphasis is upon setting up of mathematical models and a careful study of their properties rather than upon logical design and/or techniques of computation. 3 hr. rec.

311. Switching Circuit Theory II. 3 hr. PR: E.E. 310. This course is a continuation of E.E. 310. 3 hr. rec.

325. Advanced Linear Circuit Analysis. 3 hr. PR: Consent. Systematic formulation of circuit equations using topological methods. Application of matrix algebra and complex variable theory to circuit analysis. 3 hr. rec.

326. Advanced Electric and Magnetic Field Theory. 3 hr. PR: Consent. Maxwell's equations. Electromagnetic waves. Poynting vectors, guided waves. 3 hr. rec.

327. Theory of Guided Waves. 3 hr. PR: E.E. 326. Transverse electromagnetic waves; propagation in cylindrical waveguides; in homogenously filled waveguides; waveguide discontinuities. 3 hr. rec.

330. Electrical Machinery. 3 hr. PR: E.E. 235 or consent. Advanced theory of synchronous and induction machinery following Parks-Doherty-Nickel theory; applications of matrix algebra and tensor analysis. 3 hr. rec.

348. Nonlinear Problems in Electrical Engineering. 3 hr. PR: Consent. A study of the solution of nonlinear differential equations encountered in electrical engineering and automatic control. 3 hr. rec.

350. Electronic Circuits. 3 hr. PR: E.E. 252. An advanced study for the analysis and design of electronic circuits. 3 hr. rec.

351. Physical Electronics. 3 hr. PR: E.E. 253 or consent. Application of principles of physics to predict the external characteristics of electronic devices. 3 hr. rec.

361. Modern Network Synthesis. 3 hr. PR: E.E. 325. A study of the basic methods of modern network synthesis with applications to communications and automatic control systems. 3 hr. rec.

364. Communications Theory. 3 hr. PR: E.E. 264, E.E. 325. Mathematical representation of signals; information measurement and channel capacity; network analysis with random signals and noise. 3 hr. rec.

366. Information Theory I. 3 hr. PR: E.E. 364. Probability concepts; theory of discrete systems; encoding; theory of continuous systems; systems with memory; the fundamental theorem of information theory. 3 hr. rec.

367. Information Theory II. 3 hr. Continuation of E.E. 366. 3 hr. rec.

380. Electrical Problems. 1-6 hr. For graduate students.

386. Feedback System Theory. 3 hr. PR: E.E. 286, E.E. 325. Signal flow graphs; sensitivity; return difference; mathematical definition of feedback; effects of feedback; multiple loop systems; state variable techniques; multivariable systems. 3 hr. rec.

387. Sampled-Data Control Systems. 3 hr. PR: E.E. 386 or consent. A study of control systems in which the activating signal is represented by samples at regular time intervals. 3 hr. rec.

388. Synthesis of Feedback Systems I. 3 hr. PR: E.E. 364, E.E. 386. Methods of direct synthesis and optimization of feedback systems; Wiener theory; Pontryagin's maximum principle; dynamic programming; adaptive feedback systems. 3 hr. rec.

389. Synthesis of Feedback Systems II. 3 hr. Continuation of E.E. 388. 3 hr. rec.

397. Research. 1-15 hr. Advanced research or special investigations on some topic related to electrical engineering.

INDUSTRIAL ENGINEERING

Master of Science in Industrial Engineering

Students must comply with rules and regulations as outlined in General Requirements for graduate work in the College of Engineering.

The M.S.I.E. degree program is designed to serve the graduate needs of a person holding a B.S.I.E. degree or an Industrial Engineering option in another field of engineering. Also, a person holding a degree in another field of engineering but who is willing to essentially fulfill the requirements of a B.S.I.E. degree may elect to pursue the M.S.I.E. degree. A review of the aims and objectives of each individual will permit exact evaluation of the courses required.

There are five core areas of study available.

Core I:	Systems and Controls
Core II:	Operations Research, Statistical Analysis, and Computing
Core III:	Production and Methods Planning
Core IV:	Manufacturing Processing and Tooling
Core V:	General Industrial Engineering
Core VI:	Human Factors Engineering

Courses. No rigid curriculum is set up for the M.S.I.E. or M.S. degrees. At least half of the 30 hours required for either degree must be in courses in the Department of Industrial Engineering. At least 12 hours must be courses included in the particular core area chosen. (Exception: In Core Area V, at least half of the 30 hours must be in the 300 number series.) A minor may be selected in another core area, in another branch of engineering, in mathematics, or in the College of Commerce.

Thesis. A thesis is required of all candidates for either degree and in practically all cases it will be necessary to take all of the six hours of research work (I.E. 397). A thesis, however, is not automatically approved after the required number of semester hours of research work has been completed. The thesis must be presented in a form that conforms to the general requirements of the Graduate School, and in addition must conform to the additional thesis requirements of the department.

Thesis Supervisor. Each student will be assigned to a thesis supervisor who will normally serve as chairman of his Examining and Advisory Committee.

Final Examination. On completion of his thesis and course work, the candidate will be given an oral examination by his Examining and Advisory Committee; additional examiners may be called in for this examination.

I.E.

200. Metal-Cutting Theory and Practice. 3 hr. PR: I.E. 100, and Ch.E. 250. Metal-cutting tools, tool materials, work materials, cutting fluids, process of chip formation, cutting forces, tool-life tests, economic tool life, measurement of product. 2 hr. rec., 3 hr. lab.

201. Metal Forming Manufacturing Processes. 3 hr. PR: I.E. 100 or consent. Applications and operations of the basic metal forming processes including the primary metal working processes and the metal shearing, drawing, binding, and squeezing processes, along with the machine tools required for these processes. 3 hr. rec.

205. Metal Forming Theory. 3 hr. PR: I.E. 201. A study of the mechanics and basics of metal forming with elementary theoretical and descriptive investigations of tube-sinking, deep-drawing, wire-drawing, extrusion, cold rolling, and forging. 3 hr. rec.

207. Metal Casting Manufacturing Processes. 3 hr. PR: I.E. 100 and Mat.E. 250 or consent. Fluidity processes used in industry covering non-permanent processes such as sand molding, centrifugal molding, investment molding, and shell molding. Some permanent mold methods will be investigated along with metal melting processes, molding machines, and fundamentals of costing design. 3 hr. rec.

211. Industrial Engineering Problems. 1-3 hr. PR: I.E. 140, and senior standing. Special problems relating to industrial engineering.

*214. Advanced Analysis of Engineering Data. S. 3 hr. PR: I.E. 244. The application of advanced theories of statistical techniques to analyze and interpret industrial problems. Subjects include multiple regression, curvilinear regression, advanced analysis of variance, randomized complete blocks, Latin Square designs, factorial designs, transformations, and analysis of response curves. Accent is on proper design of experiments, proper interpretation of results, and thorough consideration of all errors of estimation and errors of inference. 3 hr. rec.

*215. Statistical Decision Making. 3 hr. PR: I.E. 244 or consent. Probability relating to decision processes and essential logic in the applications of statistics and how management can recognize situations in which it will be profitable to employ them. 3 hr. rec.

*240. Motion and Time Study. 3 hr. PR: Junior standing. Not for industrial engineering students. Principal aims and applications of time and motion study. Job analysis, standardizations, use of stop watch micromotion analysis, operation and methods analysis. 2 hr. rec., 3 hr. lab.

*244. Engineering Statistics. 3 hr. PR or conc: Math. 108. The use of graphical analysis; measures of central tendency and dispersion; normal, binomial,

and Poisson distributions in engineering applications; linear regression and correlation; tests of significance, nonparametric statistics, and analysis of variance. 3 hr. rec.

*250. Electronic Computer Data Processing. 3 hr. PR: Senior standing. Fundamentals of digital computer operations, equipment characteristics, input and output components. Elements of number systems. Fundamentals of "IR," information retrieval. Emphasis is placed on integrated systems analysis and design, business and industrial data for computer applications, and fundamentals of programming. Existing equipment systems and the economics of their applications will be reviewed.

253. Analytical Techniques of Operations Research. 3 hr. PR: I.E. 244, Math. 108. A study of the analytical techniques used in operations research and industrial engineering with special emphasis on their application to industrial systems and operations. The applications of matrix algebra, vectors and convex set theory to linear programming. Minimization techniques including differencing, differentiation of single and multiple integrals and Lagrangian multipliers with application to production and inventory problems. Markov Processes with applications to production problems and decision making. 3 hr. rec.

*254. Introduction to Operations Research. 3 hr. PR: I.E. 244, and conc: I.E. 142 or consent. Economic problems of production management, schematic models, linear programming, total value analysis, incremental analysis, Monte Carlo analysis, and equipment investment analysis. 3 hr. rec.

*281. Digital Computation for Engineers. 3 hr. Conc.: Math. 116. Study of processes of broadly integrating the digital computer into service for the engineer or scientist and study of the programming process with emphasis on coding with the automatic programming language Fortran. Considerable use will be made of the Computing Center equipment, especially the IBM 7040-1401 combination. Various other programming languages such as COBOL and ALGOL will be reviewed. Considerable time will also be devoted to topics such as real-time control, principles of computer functions, study of available equipment, broad use categories of equipment, etc. 2 hr. rec., 3 hr. lab.

*287. Engineering Economy. 3 hr. PR: Junior standing. Comparison of the relative economy of engineering alternatives; compound interest in relation to calculation of annual costs; present worth and prospective rates of return on investments; methods of depreciation; sunk costs, increment costs; general economy studies with emphasis on retirement and replacement of equipment; consideration of taxes, public works, and manufacturing costs as related to economic solution of engineering proposals. 3 hr. rec.

*288. Job Evaluation and Wage Incentives. 2 hr. PR: I.E. 140 or consent. Principles used in evaluating jobs, rates of pay, characteristics and objectives of wage incentive plans; incentive formulae and curves. 2 hr. rec.

*290. Industrial Statistics. 2 hr. PR: I.E. 244. Economic objectives of quality control in manufacturing through sampling methods; the Shewhart control chart for variables, attributes, and defects per unit; satistical approach to acceptance procedures. 2 hr. rec.

292. Plant Layout and Design. 3 hr. PR: I.E. 110 and 142. Problems in industrial plant design. Equipment location, space utilization, layout for operation and control, flow sheets, materials handling. Allied topics in power utilization, light, heat, and ventilation. 1 hr. rec., 6 hr. lab.

*294. Standard Manufacturing Costs. 3 hr. PR: I.E. 151. Development of standards for labor, material, and overhead expenses; uses of standards for control; analyses of variances between standard and actual costs. 3 hr. rec.

299. Human Factors Engineering. 3 hr. PR: I.E. 140, Psych. 115 or consent. An examination of human factors engineering and man-machine systems to include a study of ambient environment, human capabilities and equipment

design. Application of human factors engineering in workplace design, maintainability, and task design methodology. Study of system design for man-computer interface, life support requirements, simulators and man-machine systems. 2 hr. rec., 3 hr. lab.

300. Advanced Metal-Cutting Theory and Practice. 3 hr. PR: I.E. 200. The development of metal-cutting as a science through research, cutting-fluid theory, machinability of materials, tool materials, hot machining, tool-life tests, economics of machining. 2 hr. rec., 3 hr. lab.

310. Advanced Manufacturing Processes. 3 hr. PR: I.E. 100. A study of the newer and more complex manufacturing methods used in industry today. Welding and forming of titanium, magnesium, beryllium, and similar metals; assembly processes; powder metallurgy; adhesives and bonds; roll milling; electrical and chemical operations such as electro-forming and hot-dipping operations; hot forging; high energy rate forming (HERF); automated manufacturing processes including transfer mechanisms, continuous, and point-to-point numerical control; plastic tooling and fabrication methods; marking processes; and other manufacturing processes will be examined. 3 hr. rec.

311. Seminar. 1-3 hr. PR: Consent. Discussion of research in Industrial Engineering and special problems.

312. Automation in Industry. 3 hr. PR: I.E. 100 or consent. The evolution, production fundamentals, and control systems of the principle fully automatic machine tools, both fixed and flexible, will be covered along with the basic philosophy, fundamentals, and methods of automation as practiced in industry today. 2 hr. rec., 3 hr. lab.

315. Management Control. 3 hr. PR: I.E. 151 or consent. A study of effective techniques for higher management control; a study of integrated and related control data to aid in establishing a preconceived goal. 3 hr. rec.

344. Advanced Design of Industrial Experiments. 3 hr. PR: I.E. 214. A study of several of the more complex statistical methods including sequential analysis, analysis of covariance, multiple range tests, transformation of data, large factorial experiments, confounding, fractional replication, split-plot designs, lattice designs with one and two restrictions on treatment allocation, with special emphasis on the power, relative efficiency, and interpretation of these designs.

350. Queueing Theory. 3 hr. PR: I.E. 244. Best operating conditions for systems involving waiting times. Elements of stochastic processes. Single-channel and multi-channel models. Computational methods, including Monte Carlo techniques. Applications to problems such as maintenance and inventory control. 3 hr. rec.

351. Theory of Linear Programming. 3 hr. PR: I.E. 244 and I.E. 253 or consent. Extreme point solutions and their generation. Development of the simplex procedure. Duality problems in linear programming. Revised simplex procedure. Degeneracy procedures. Transportation problems. Selected topics related to linear programming. 3 hr. rec.

352. Introduction to Inventory Theory. 3 hr. PR: I.E. 215, 253, and 254. A study of techniques used in the optimization of inventory systems. Elements of static, deterministic inventory models, and static, stochastic inventory models. Dynamic inventory models. Selected topics related to inventory analysis. 3 hr. rec.

354. Special Topics in Systems Analysis and Operations Research. 3-6 hr. PR: Consent. Special topics from recent developments in operations research and related fields. Special emphasis will be placed on interests of current graduate students.

361. Methods Analysis and Work Simplification. 3 hr. PR: I.E. 140, 287. An advanced study of the techniques of methods analysis, including modern means of methods research. Development of appropriate cost analyses to accompany improved operating plans. A study of the design, installation, and

administration of work simplification programs, suggestion systems, and remuneration policies, and the means of intra-plant comunications concerning such programs. 2 hr. rec., 3 hr. lab.

370. Theory of Industrial Engineering and Organization. 3 hr. PR: Graduate standing and consent. History and development of scientific management in industry with early works of Taylor, Galbreth, and Gantt, to the present time. 3 hr. rec.

371. Methods Analysis. 2 hr. PR: I.E. 140 or I.E. 240. An advanced study of the technique of methods analysis as an effective means of methods improvement and cost reduction. 2 hr. rec.

372. Advanced Time Study. 3 hr. PR: I.E. 140. Review of the various investigations which have been made, with special consideration given to the development of these studies into new fields. 3 hr. rec.

373. Budget Control. 3 hr. PR: I.E. 294. Principles involved in the preparation of budgets by functional divisions and the application of divisional budgets as control media. 3 hr. rec.

374. Advanced Engineering Economy. 3 hr. PR: I.E. 287. Special emphasis on depreciation, engineering and economic aspects of selection and replacement of equipment; relationship of technical economy to income taxation and load factor and capacity to economy. 3 hr. rec.

380. Integrated Data Processing. 3 hr. PR: I.E. 281 and consent. Advanced work in electronic data-processing systems and procedures design. Case studies of integrated data-processing systems. Course projects will include individual use of a computer in management data-processing analysis problems. 3 hr. rec.

381. Digital Computer Applications. 1 hr. PR: Graduate standing in Engineering, Physical Science or Mathematics. Introduction to methods of digital computation and study of the programming process with emphasis on coding with an automatic programming language for scientific problems (FORTRAN). The student will have considerable opportunity to analyze engineering and scientific problems using the facilities available at the University Data Processing Center. 2 hr. rec., 3 hr. lab. (5-week period.)

390. Advanced Industrial Statistics. 3 hr. PR: I.E. 290. Advanced study of 10 per cent-, double-, and sequential-sampling procedures, problems of application of statistical quality control methods in industries. 3 hr. rec.

397. Research. 1-15 hr. Investigation or original research on some special topic relating to industrial engineering.

399. Human Factors System Design. 3 hr. PR: I.E. 299, or consent. Application of human factors engineering in workplace design, maintainability, and task design methodology. A study of system design for man-computer interface, life support requirements, simulators, and man-machine systems. Research work in lab deals with human factors system design. 3 hr. rec.

MECHANICAL ENGINEERING

Master of Science in Mechanical Engineering

Students must comply with rules and regulations as outlined in General Requirements for graduate work in the College of Engineering. In addition, a graduate student in the Department of Mechanical Engineering must comply with departmental requirements outlined below:

Thesis. A thesis is required, except in unusual circumstances, of all candidates for the Master of Science degree in Mechanical Engineering.

Courses. No rigid curriculum is set up for the M.S.M.E. degree: however, the following grouping of courses is given as a guide for selecting a graduate program.

In general, at least half of the hours required for the degree should be in courses in the 300 series.

Group I. *Required of all candidates**	Hr.
Math. 254. Advanced course in Applied Mathematics	3
OR	
Two 200 level Math. courses	6
M.E. 397. Research	6

Group II. *A minimum of 12 credit hours required.*	Hr.
M.E. 202. Engineering Analysis and Design	3
M.E. 204. Mechanical Vibrations	3
M.E. 205. Advanced Kinematics	3
M.E. 225. Problem in Thermodynamics	3
M.E. 230. Heat Transmission	3
M.E. 231. Introduction to Gas Dynamics	3
M.E. 260. Introduction to Engineering Systems Analysis	3
M.E. 265. Engineering Acoustics	3
M.E. 271. Intro. to Feedback Control Theory	3
M.E. 300. Seminar	1-3
M.E. 303. Advanced Machine Design	3
M.E. 304. Advanced Vibrations	3
M.E. 305. Random Vibrations	3
M.E. 320. Advanced Thermodynamics I	3
M.E. 321. Advanced Thermodynamics II	3
M.E. 330. Advanced Heat Transfer	3
M.E. 331. Advanced Heat Transfer	3
M.E. 351. Advanced Combustion Engines	3
M.E. 352. Turbomachinery	3
M.E. 354. Advanced Refrigeration	3
M.E. 360. Engineering Similitudes	3

Group III.	Hr.
T.A.M. 200. Advanced Mechanics of Materials	3
T.A.M. 309. Statistical Applications in Mechanics	3
T.A.M. 310. Applied Mechanics of Materials	3
T.A.M. 312. Inelastic Behavior of Materials	3
T.A.M. 320. Theory of Elasticity	3
T.A.M. 340. Photoelasticity	3
Phys. 225. Introduction to Modern Physics	3
Phys. 226. Introduction to Modern Physics	3
Ch.E. 248. Statistical Design of Experiments	2
Ch.E. 290. Introduction to Nuclear Engineering	3
Any course recommended by Advisory Committee	Variable Credit

*Candidates already having credit for Math. 254 must enroll in courses from either Group II or Group III in order to meet the minimum hours required. Students doing non-thesis or non-problem degrees must enroll in courses from Group II or Group III in order to meet the minimum hours required.

The Degree of Doctor of Philosophy

Graduate students electing Mechanical Engineering as their major should have had the equivalent of an undergraduate degree in engineering or be willing to remove any deficiencies in background. The candidates must comply with the rules and regulations as outlined in General Requirements for graduate work in the College of Engineering. The candidate's program will be developed to meet his needs and objectives.

The research work for the doctoral dissertation must show a high degree of originality on the part of the candidate and should constitute an original contribution to the art and science of engineering. The candidate is required to submit to a final examination upon the completion of the dissertation in defense of his research.

M.S.

201. Design of Machine Members. 3 hr. PR: T.A.M. 103 and M.E. 112 or consent. Analysis and design of machine members based on the theory of strength of materials and its modifications due to manufacturing processes and economic considerations. Emphasis is on rational methods and the development of judgment in the design. 1 hr. rec., 6 hr. lab.

202. Engineering Analysis and Design. 3 hr. PR: M.E. 201 and consent. Use of fundamental principles of mathematics, statics, physics, mechanics, thermodynamics, and heat transfer in the rigorous analysis of engineering problems. Determination of the critical specifications of the problem solution and the use of a creative approach to the satisfaction of these critical specifications in a workable system. 2 hr. rec., 3 hr. lab.

203. Machine Design. 3 hr. PR: M.E. 201. Design of complete machines to perform given functions. Creative design is encouraged to provide new ideas. Final designs are selected to perform the function, be economical and easy to fabricate, and have a generally pleasing appearance. 1 hr. rec., 6 hr. lab.

204. Mechanical Vibrations. 3 hr. PR: Math. 253 and T.A.M. 104 or consent. Fundamentals of vibration theory. Free and forced vibration of one, two and multiple degree of freedom systems, transient analysis. Solution by Fourier and Laplace Transformation. Methods of Rayleigh, Holzer and Stodola. Conservative systems and LaGrange's equation. 3 hr. rec.

205. Kinematics. 3 hr. PR: M.E. 112 and Math. 253, or consent. Geometry of constrained motion, kinematic synthesis and design, spacial linkages. Coupler curves, inflection circle Euler-Savary equation, cubic of stationary curvature and finite displacement techniques. 3 hr. rec.

223. Power Plants. 3 hr. PR: M.E. 125. Principles of design and operation of modern steam power plants for central stations and for process industries. Each student submits an individual design problem. 3 hr. rec.

224. Steam Turbines. 3 hr. PR: M.E. 125. The theory of fluid dynamics and the thermodynamics of the modern turbines; materials, construction details and design of important elements; influences on economy of variations in cycles and operative ranges. 3 hr. rec.

225. Problems in Thermodynamics. 3 hr. PR: M.E. 125 or consent. Detailed study of thermodynamics systems with special emphasis on actual processes. The problems presented are designed to strengthen the background of the student in the application of the fundamental thermodynamic concepts. 2 hr. rec., 3 hr. lab.

229. Internal Combustion Engines. 3 hr. PR: M.E. 121 or M.E. 125. The thermodynamics of the internal combustion engines; Otto cycle; Diesel cycle; two- and four-cycle engines, fuels, carburetion and fuel injection; combustion; engine performance, supercharging. 3 hr. rec.

230. Heat Transfer I. 3 hr. PR: M.E. 120 or M.E. 121. Steady state and transient conduction, including extended surface and numerical methods, emphasizing both forward and backward time step methods. Thermal radiation including radiation functions and radiation network theory. Boundary layer equations and forced and free convection are also covered. 3 hr. rec.

231. Introduction to Gas Dynamics. 3 hr. PR: M.E. 125 or M.E. 121, Math. 240 and Math. 253. The basic fundamentals of gas dynamics, one-dimensional gas dynamics and wave motion, methods of measurement, effect of viscosity and conductivity, and concepts from gas kinetics. 3 hr. rec.

235. Heat Transfer II. 3 hr. PR: M.E. 230. A continuation of M.E. 230, covering nonlinear extended surface; gas radiation; freezing; heat exchanger theory; recovery factor and high speed flow; and mass transfer. Also, periodic flow and application of the digital computer to problems in heat transfer. 3 hr. rec.

250. Heating, Ventilating, and Air Conditioning. 3 hr. PR: M.E. 125 or consent. Methods and systems of heating, ventilating, and air conditioning of various types of buildings, types of controls and their application. 3 hr. rec.

260. Introductory Engineering Systems Analysis. 3 hr. PR: Senior standing. A study of analogous and mixed systems. Similitude of mechanical, electrical, and acoustic dynamic systems. Dimensional analysis and theory of model design. 3 hr. rec.

265. Engineering Acoustics. 3 hr. PR: Math. 253 and consent. Use of fundamental principles of mathematics and physics to develop the basic theories of sound. Application of these theories involving sound in closed areas, the various modes of sound transmission, noise control and psycho-acoustic criteria. 3 hr. rec.

271. Introduction to Feedback Control Theory. 3 hr. PR: M.E. 125 or M.E. 121 and C.E. 115 or conc: C.E. 115. Use of fundamental properties of fluids and fluid flow in the operation of power control systems. The theory and design of hydraulic and air operated control components with special emphasis on automatic circuits. 3 hr. rec.

280. Mechanical Problems. 1-6 hr. For junior, senior, and graduate students.

300. Seminar. 1-3 hr. PR: Consent. Discussion, library readings, and individual study reports in the mechanical engineering field.

303. Advanced Machine Design. 3 hr. PR: M.E. 203. Stresses in indeterminate machine parts, experimental stress analysis. Design for high temperatures, pressures and speeds. Bearings and lubrication. Rotating discs and elastic stability and high speeds. Residual stresses and creep. 3 hr. rec.

304. Advanced Vibrations. 3 hr. PR: M.E. 204 or consent. Dynamic and harmonic analysis of multiple degree of freedom and continuous linear systems. Lagranges equations and matrix techniques. Use of analog and numerical techniques. 3 hr. rec.

305. Random Vibrations. 3 hr. PR: M.E. 204 or consent. Characterization of random motion. Response of linear time invariant systems. First and second failure problems. Fatigue under random excitation. 3 hr. rec.

320. Advanced Thermodynamics. 3 hr. PR: M.E. 125. Definitions and scope of thermodynamics. First and Second laws, Maxwell's relation, Calpeyron relations, equation of state, thermodynamics of reactive systems, availability.

321. Advanced Thermodynamics II. 3 hr. PR: M.E. 320 or consent. Methods of statistical mechanics; concept of temperature; perfect diatomic gases and crystalline solids, Jacobian equations of thermodynamics; grand potential function; inherently irreversible processes.

330. Advanced Heat Transfer. 3 hr. PR: M.E. 230 or consent. Analytical and application treatment of steady state and transient conduction, including internal generation, integral equation forms, numerical solutions and minimum weight fin theory. Boundary layer theory of forced convection, Nusselt film theory of condensation and boiling theory.

331. Advanced Heat Transfer. 3 hr. PR: M.E. 330 or consent. Continuation of M.E. 330. Thermal radiation theory and application in addition to measurement errors and techniques. Topics covered will be radiation network theory, radiation functions and theory of emissivity. Some time is allowed for modern developments in heat transfer including the solution of heat transfer problems on digital computers.

351. Advanced Internal Combustion Engines. 3 hr. PR: M.E. 229 or consent. Combustion in spark ignition engines; compression ignition engines; detonation; fuel-air ratios; heat losses; lubrication; efficiencies; two-stroke engines; four-stroke engines; performance, exhaust turbines; gas turbines. 3 hr. rec.

352. Turbomachinery. 3 hr. PR: M.E. 121 or M.E. 125. A study of flow problems encountered in the design of water, gas, and steam turbines, centrifugal and axial flow pumps and compressors, design parameters.

354. Advanced Refrigeration. 3 hr. PR: M.E. 250. Thermodynamics of vapor cycles, refrigerants, fluid flow, heat transfer, psychometrics, types of refrigeration and equipment required, application of refrigeration in industry, food preservation. 3 hr. rec.

360. Engineering Similitudes. 3 hr. PR: Consent. Development of the dimensional analysis concepts and techniques and their application in model design. Rational approach to the design of distorted models. Study of analogies from a standpoint of model-prototype relations. 3 hr. rec.

397. Research. 1-15 hr. Investigation or original research on some topic relating to mechanical engineering.

THEORETICAL AND APPLIED MECHANICS

Master of Science in Theoretical and Applied Mechanics

Students must comply with rules and regulations as outlined in General Requirements for graduate work in the College of Engineering.

Courses. At least 30 semester hours are required for the degree of Master of Science in Theoretical and Applied Mechanics. At last 12 of these hours, exclusive of thesis, must be in the Department of Theoretical and Applied Mechanics. As many courses as are possible should be in the 300 series. A minor in one of the other branches of engineering, physics, or mathematics is recommended.

Thesis. A thesis is required of all candidates for the degree of Master of Science in Theoretical and Applied Mechanics, and is ordinarily for 6 hours credit. The thesis will be accepted only after approval by the thesis committee. The thesis must conform to the general requirements of the Graduate School and to the additional requirements of the Department.

Thesis Supervisor. Each student will be assigned a thesis supervisor who will serve as chairman of his thesis committee.

Final Examination. On completion of his thesis, the candidate for the degree of Master of Science in Theoretical and Applied Mechanics will be given an oral examination by his thesis committee. Additional examiners may be called in for this examination.

The Degree of Doctor of Philosophy

Graduate students electing Theoretical and Applied Mechanics as their major must have had the equivalent of the undergraduate courses in mechanics required for a bachelor's degree in any of the curricula in the College of Engineering.

A graduate student who has received a Master's degree from a school which has an undergraduate curriculum in the area of his Master's degree accredited by E.C.P.D. may pursue a Ph.D. degree in Theoretical and Applied Mechanics if he meets the other requirements of the Department.

Candidates for the Doctor of Philosophy degree, regardless of their specific major, must attain a proficiency in each of the following areas: (1) mechanics of solids, (2) mechanics of fluids, (3) dynamics, (4) experimental mechanics, and (5) applied mathematics.

T.A.M.

200. Advanced Mechanics of Materials I. 3 hr. PR: T.A.M. 103 or consent. Energy methods; localized stresses; curved flexural members; torsion of noncircular sections; thick-walled cylinders and rotating disks; contact stresses.

201. Theory and Application of Oscillatory Phenomena. 3 hr. PR: T.A.M. 104. Study of oscillations or vibrations in acoustical, electrical, hydraulic and mechanical systems. 3 hr. rec.

202. Advanced Materials Laboratory. 2-4 hr. PR: T.A.M. 103. Continuation of T.A.M. 103 with emphasis on a selected problem or problems.

203. Experimental Stress Analysis. 3 hr. PR: T.A.M. 103, 104. Introduction to some of the more common experimental methods of analyzing stress distributions. Photoelasticity, brittle lacquers, birefringent coatings, strain gage techniques and instrumentation, as applied to problems involving static, dynamic and residual stress distributions. 2 hr. rec., 3 hr. lab.

250. Intermediate Dynamics. 3 hr. PR: Math. 253, T.A.M. 104. Mechanics of a particle; curvilinear coordinates, geometry of space curves, moving reference frames, generalized coordinates. Dynamical principles; D'Alembert's

principle, principle of virtual work, Lagrange's equations, variational formulation of Hamilton's principle. Simple non-linear systems. 3 hr. rec.

280. Special Problems in Mechanics. 1-3 hr. PR: T.A.M. 103 and consent. For junior, senior, and graduate students.

302. Analytical Methods in Engineering. 3 hr. PR: Math. 253 or consent. A course designed to provide training in the applications of mathematical analysis to engineering problems. Course content to include: index notation; determinant, matrices, and quadratic forms; linear transformations, eigenvalue problems; complex variables; analytic functions, Taylor and Laurent expansions, residue theory, applications of conformal mapping; ordinary linear differential equations in the complex plane, existence and uniqueness theorics, series solution for regular and irregular singularities, Legendre and Bessel equation, integral solutions. 3 hr. rec.

303. Analytical Methods in Engineering. 3 hr. PR: T.A.M. 302 or consent. Continuation of T.A.M. 302. Course content to include: partial differential equations, method of characteristics, initial and boundary conditions; Dirichlet, Neumann, vibrating string, and other related problems; calculus of variations, stationary values of functions and functionals, Euler equations and boundary conditions, Lagrange multipliers, second variation for maximum problems, applications such as Hamilton's principle, linear integral equations, equations of the first and second kind, solution by successive substitution and approximation, eigen-values and eigen-functions, Fredholm theory, applications. 3 hr. rec.

310. Advanced Mechanics of Materials II. 3 hr. PR: Consent. Membranc stresses in shells; bending of flat plates; two-dimensional elasticity; beams on elastic supports. 3 hr. rec.

312. Inelastic Behavior of Engineering Materials. 3 hr. PR: T.A.M. 200. Rheological aspects of inelastic behavior; inelastic load-stress relationship for members subjected to axial, bending, torsion and buckling loads. Analytical stress-strain relationship and use of Ramberg-Osgood paramcters. Combined loading, interaction curves and their use. Statically indeterminate members loaded inelastically; inelastic buckling theory. 3 hr. rec.

314. Theory of Buckling. 3 hr. PR: Consent. Fundamental theorems for the investigation of stability of mechanical systems. Application to discrete systems and development of stability equations for elastic bodies. 3 hr. rec.

316. Energy Methods in Applied Mechanics. 3 hr. PR: Consent. Introduction to variational principal of mechanics and applications to engineering problems; principle of virtual displacements, principle of minimum potential energy, principle of complementary energy, Castigliano's theorem, Hamilton's principle. Applications of energy principles to stress analysis of frames, rings, curved beams, elastic plates. 3 hr. rec.

318. Continum Mechanics. 3 hr. PR: Undergraduate mechanics and Math. 253. A course designed to emphasize the basic laws of physical behavior of continuous media. Course content to include: analysis of stress; equations of motion and boundary conditions; kinematic analysis; rates of strain, dilatation and rotation; bulk time, rates of change; constitutive equations with special attention to elastic bodies and ideal fluids; energy equations and the first law of thermodynamics. 3 hr. rec.

319. Non-Linear Continuum Mechanics. 3 hr. PR: T.A.M. 318 or consent. Study of the basic laws of continuous media in the language of generalized tensors. Emphasis on the structure of the constitutive equations for various classes of media with particular attention to elastic, hypoclastic, plastic and viscoelastic media. Reference texts: Eringen, Prager, Green & Zerna, Green & Adkins, Hill. 3 hr. rec.

320. Theory of Elasticity I. 3 hr. PR: Math. 253 or consent. A basic solid mechanics course to include: Cartesean tensors; equations of classical elasticity, energy, minimum, and uniqueness theorems for the first and second boundary value problems; St.-Venant principle; extension, torsion, and bending problems. 3 hr. rec.

321. Theory of Elasticity II. 3 hr. PR: T.A.M. 320. Continuation of T.A.M. 320 with course content to include: generalized tensors; equations of finite elasticity; equations of classical elasticity in generalized coordinates; complex variables and potentials; plane stress and strain; various special problems. 3 hr. rec.

324. Theory of Thin Shells. 3 hr. PR: Consent. Theoretical basis for analysis of shell-type structures. Material includes differential geometry of surfaces, current shell theories, and stability criteria. 3 hr. rec.

330. Instrumentation in Engineering I. 3 hr. PR: T.A.M. 104 or equiv. Theory of measuring instruments, with emphasis on dynamic, as opposed to static or slowly changing, measurements of force, pressure, displacement, vibration, temperature, etc. Also, selection of instruments for specific purposes. 2 hr. rec., 3 hr. lab.

331. Instrumentation in Engineering II. 3 hr. PR: T.A.M. 330. Continuation of T.A.M. 330 with emphasis on transducers for static and dynamic measurement, and their use in practical measuring systems. 3 hr. rec.

340. Photoelasticity. 3 hr. PR: T.A.M. 200, 203. Theory of optics, birefringence, stress-optic law, polariscope, compensation. Techniques of model making, photography, polariscope use. Photoelastic coating methods and use of various reflective polariscopes. Data interpretation by various methods including principal stress separation by shear difference and graphical integration. 2 hr. rec., 3 hr. lab.

350. Advanced Dynamics I. 3 hr. PR: T.A.M. 250. Continuation of T.A.M. 250. Mechanics of a system of particles; mechanics of rigid bodies; theory of moments of inertia, angular momentum and kinetic energy, Poinsot's interpretation of torque-free motion, Euler's angles, Euler's dynamical equations, pitch, roll, yaw, spinning top, gyroscopes, etc. 3 hr. rec.

351. Advanced Dynamics II. 3 hr. PR: Consent. Dynamics of continuous solids. Wave motion; study of string motion in detail in order to introduce methods for attacking more general problems, vibration of beams, membranes and plates. Stress propagation in unlimited solids; dilitational, distortional, and surface waves. 3 hr. rec.

380. Advanced Independent Study. 1-3 hr. PR: Consent. Individual investigation, either analytical or experimental, in one or more phases of advanced mechanics.

397. Research. 1-15 hr. Advanced research or special investigations on some topic related to mechanics.

MINES

The School of Mines offers graduate curricula leading to the Master of Science degree in two fields—mining engineering and petroleum engineering. A student desiring to take courses for graduate credit in the School of Mines must first comply with the appropriate regulations of the Graduate School.

After admission to the Graduate School, a student desiring to become a candidate for a graduate degree must apply for admission to the School of Mines in the major field of his choice.

An applicant with a baccalaureate degree or its equivalent in the major field corresponding to the graduate study desired, from a department accredited by the Engineers' Council for Professional Development, will be admitted on the same basis as graduates of West Virginia University. Lacking these qualifications, an applicant must first fulfill the School of Mines' requirements in the field in which he is seeking an advanced degree.

Approval for candidacy for a graduate degree by faculty action is required to establish eligibility for a degree. A graduate student may request approval by formal application after completing a minimum of 12 semester hours of graduate courses with a grade-point average of at least 3.0 (B), based on all graduate courses in residence for which final grades have been recorded.

Academic Standards. No credits are acceptable toward an advanced degree which are reported with a grade lower than "C." To qualify for an advanced degree, a graduate student must have a grade-point average of at least 3.0 based on all courses completed in residence for graduate credit. Each candidate for a degree must select a major subject and submit a thesis showing marked attainment in that field.

ENGINEERING OF MINES

E.M.

200. Elements of Mineral Conservation. I. 3 hr. PR: Open to any student in the University with junior standing. A study of the future demands for mineral resources including coal, water, oil, gas, ores, and industrial minerals and the causes of mineral loss in production and utilization and how to avoid or minimize them.

201. Fire Control Engineering. 3 or 4 hr. PR: Senior standing in an engineering curriculum or consent. The aspects involved in the control from fire, explosion and other related hazards. Protective considerations in building design and construction. Fire and explosive protection organization including fire detection and control. Lectures 3 and/or lab. 1 hr.

207. Introductory Seismology. I, II. 1 hr. PR: Physics 102. Earthquakes and the causes and area distribution; theory of elastic waves; the principles of seismograph construction, adjustment, and operation; interpretation and calculation of seismograms with exercises provided by records of the University seismograph station. 1 hr. rec.

209. Mineral Preparation. I, II. 3 hr. PR: T.A.M. 104 or consent. Principles of preparation, beneficiation and concentration of metallic and non-metallic ores for further processing or utilization. 2 hr. rec., 3 hr. lab.

212. Advanced Mining. II. 3 hr. PR: E.M. 108, E.E. 105. Engineering principles, methods and equipment applied to mine transportation, hoisting, and drainage. 3 hr. rec.

213. Mine Ventilation. I. 3 hr. PR: E.M. 108, T.A.M. 104 and C.E. 115. Principles, purposes, methods and equipment pertaining to the ventilation of mines. 2 hr. rec., 3 hr. lab.

215. Industrial Safety Engineering. I, II. 2 hr. PR: Junior standing or consent. Analysis of problems of industrial safety and accident prevention, laws pertaining to industrial safety and health, compensation plans and laws, and industrial property protection. 2 hr. rec.

217. Coal Preparation. I, II. 3 hr. PR: E.M. 212, C.E. 115, E.M. 209, and E.M. 210. Formation of coal, rank classification of coal, coal petrography, principles of preparing and beneficiating coal for market with laboratory devoted to sampling, screen analysis, float and sink separation and use of various types of coal cleaning equipment. 2 hr. rec., 3 hr. lab.

218. Advanced Mineral Preparation. I, II. 3 hr. PR: E.M. 108, E.M. 209, and E.M. 210. The theory and practice of concentration ores, and industrial minerals with special consideration to the more recent advances in the beneficiation of both ores and coal. 2 hr. rec., 3 hr. lab.

219. Advanced Mining Methods for Vein Deposits. I, II. 3 hr. PR: E.M. 108, T.A.M. 104. Methods and systems of mining other than flat seams. Emphasis placed on selection of methods in relation to cohesive strength of ore bodies and their enclosing wall rocks. Mining of anthracite seam included. 3 hr. rec.

220. Mine Design. I, II. 3 hr. PR: E.M. 212, E.M. 241, and registration in E.M. 112. A comprehensive design problem involving underground mining developments or design of surface plant or both, as elected by the student in consultation with the instructor. A complete report on the problem is required including drawings, specifications and cost analysis. 9 hr. lab.

221. Mine Design. I, II. 2 hr. PR: E.M. 217, 220. Continuation of E.M. 220 including design of preparation plant and loading facilities with full report covering plans, equipment, operation, and costs. Two 3 hr. labs.

222. Mine Equipment and Machinery. I, II. 3 hr. PR: E.E. 205, E.M. 212. Selection, installation, operation, and maintenance of mining equipment. 3 hr. rec.

223. Mine Management. II. 3 hr. PR: Math. 253, E.M. 212 and senior standing. Economic, governmental, social, and labor aspects of mining as related to the management of a mining enterprise. 3 hr. rec.

224. Mining Engineering Problems. I, II. 1-6 hr. PR: Senior or graduate standing. Investigation and detailed report on a special problem in mining engineering related to coal mining or mineral mining. Supervision and guidance by a member of the graduate faculty.

228. Mine Equipment and Machinery Controls. II. 3 hr. PR: E.M. 222 or consent. Principles, application and use of electric and hydraulic devices and circuits for protection and control of mine machinery and equipment. 3 hr. rec.

229. Advanced Mining Equipment Applications. I. 3 hr. PR: E.M. 228. Structural, mechanical, hydraulic and electrical characteristics of the more common items of mining equipment. Controls, electrical and hydraulic circuits, and mechanical transmissions with associated problems. Laboratory design of a control system for a mining machine. 2 hr. rec., 3 hr. lab.

230. Elements of Geophysical Prospecting. I. 3 hr. PR: Geol. 3, Physics 102. Principles, calculations and application of methods for locating subsurface oil, gas, and mineral deposits.

234. Applied Geophysics. II. 3 hr. PR: Physics 102 and Geol. 151 or consent. Origin of the universe and the planets, heat and age of the earth. Application of the science of geophysics in the location and analysis of earthquakes and in prospecting for oil and minerals.

241. Mechanics of Ground Control in Mines. I. 3 hr. PR: T.A.M. 102, Math. 253, E.M. 108 or consent. Structure of the earth's crust, bedding planes, joints, heterogeneity, mechanical properties of rocks, stress-time-deformation relationships in rocks, theoretical stress distribution about mine openings, practical effects, factors in mine pillar design, pillar bursts, creeps and squeezes, mining subsidence. 2 hr. rec., 3 hr. lab.

301, 302. Advanced Mine Design. I, II. Credit arranged. Advanced detail design and layout of coal mine plant, particularly incorporating new ideas of machines and mining methods.

351. Coal Mining. S. 3 hr. PR: Chemistry, 10 hr.; physics, 8 hr.; and accompanied or preceded by general geology. Especially for students who are planning to teach mining subjects in high school. Not open to students taking E.M. 108 or 212. Hours arranged.

395, 396. Graduate Seminar in Coal Mine Operation and Administration. I, II. 3-6 hr. PR: B.S. degree and consent of Committee. Group discussion and analysis of problems related to the production, preparation, marketing, and utilization of coal with special assignments and emphasis in accordance with personal background and field of interest of the individual student.

397. Research. I, II. Credit arranged. Individual problem in some phase of mining. Carefully prepared report required.

PETROLEUM ENGINEERING

Pet.E.

203. Petroleum Property Valuation and Management. II. 2 hr. PR: Pet.E. 106, Econ. 2, Math. 117 or consent. Petroleum property valuation and acquisition; economic, governmental, and social aspects of management of oil and gas properties. 2 hr. rec.

206. Natural Gas Engineering. II. 3 hr. PR: Pet.E. 106, C.E. 115. Principles of natural gas production, transmission, distribution, processing, regulation, measurement, storage and analysis with a laboratory devoted to the principles of the equipment utilized in the above named operations. 2 hr. rec., 3 hr. lab.

216. Petroleum Engineering Design. II. 3 hr. PR: Pet.E. 232, Material Engr. 250. A comprehensive problem in design involving systems in oil and gas production, field processing, transportation and storage. Three 3-hr. labs.

224. Petroleum Engineering Problems. I, II. 1-6 hr. PR: Senior or graduate standing. Investigation and detailed report on a special problem in petroleum or natural gas engineering. Supervised by a member of the graduate faculty.

232. Petroleum Reservoir Engineering. I. 5 hr. PR: Pet.E. 236. Concepts on application of properties of rocks and rock-fluids systems which are fundamental to engineering analysis of petroleum reservoirs, mechanics of fluid flow in porous media, production by depletion drive, by frontal displacement, by water drive, by segregation drive and secondary recovery. 5 hr. rec.

235. Fundamentals of Well Logging. II. 3 hr. PR: Math. 253, Pet.E. 106, or consent. Principles of the various well logging methods and related calculations with exercises in interpretation of data from actual well logs. 2 hr. rec., 3 hr. lab.

236. Mechanics of Hydrocarbon Fluids. I. 3 hr. PR: Physics 102, C.E. 115, Pet.E. 106, Chem. 163. The qualitative and quantitative phase behavior of single and multicomponent hydrocarbon systems with emphasis on application to petroleum production engineering and petroleum reservoir engineering. 2 hr. rec., 3 hr. lab.

237. Composition and Properties of Oil Well Drilling Fluids. I. 2 hr. PR: Pet.E. 106, Chem. 163 and C.E. 115. Principles of drilling fluid control including a laboratory for pilot testing, mud design procedures and measurement of composition and properties. 1 hr. rec., 3 hr. lab.

238. Oil and Gas Law. II. 2 hr. PR: Pet.E. 106. Landowners interest, the oil and gas lease, transfer of interest, conservation laws, contracts, business organization, sales, professional registration, patents. 2 hr. rec.

240. Secondary Recovery of Oil by Water Flooding. I. 3 hr. PR: Pet.E. 232 or consent. Theory of immiscible fluid displacement mechanism, evaluation, and economics of water flood projects and oil field flooding techniques. 3 hr. rec.

301. Advanced Petroleum and Natural Gas Engineering Design. I, II. Credit arranged. Advanced detail design problems in some phase of petroleum and natural gas exploration, production, and transportation, particularly incorporating new ideas, machines and methods.

397. Research. I, II. Credit arranged. An individual research problem in some phase of petroleum and natural gas exploration, production, and transportation. A carefully prepared report is required.

INDUSTRIAL RELATIONS

The degree of Master of Science with a major in Industrial Relations is offered in recognition of the growing need for specialized, interdisciplinary training in this field. The curriculum, drawn from relevant course offerings in a number of colleges, schools, and departments of the University, constitutes an integrated program of study in labor and industrial relations.

The field of industrial relations is not a separate, basic discipline like economics, political science, or sociology. Rather it represents the empirical study and practical application of knowledge gained in all the social sciences to the problem rising out of the employee-employer and union-management relationships.

Requirements for Admission

In addition to the entrance requirements of the Graduate School, the Institute requires a minimum of 21 hours of undergraduate work in the social sciences including 3 hours in statistics. (The course in statistics may have been taken in economics, psychology or engineering). A minimum grade of "C" is required in each of the courses taken to meet the 21-hour undergraduate credit requirement for admission to the program. The social sciences include economics, history, general social science, political science, psychology, and sociology.

Students are required to take the general aptitude test of the Graduate Record Examination. In certain cases, students will be admitted to the Institute without having taken the test, but they will be required to take it the first time it is offered after admission.

After the Institute has received notice of admission to the Graduate School, a copy of the official transcript of undergraduate work, and the results of the general aptitude test, students will be notified about their admission. Normally, candidates will be admitted to the Institute if they have met the requirements mentioned above and have a 2.5 (C+) grade-point average based upon the last 60 hours of undergraduate work.

Students who meet the general requirements of the Graduate School but not the special course prerequisites of the Institute may register for graduate work, but undergraduate deficiencies must be removed in the first year of residence.

Requirements for the Degree

The candidate must fulfill the general requirements of the Graduate School and must complete 30 hours of graduate work including:

1. Industrial Relations 330. Seminar in Industrial Relations. II. 3 hr. The seminar deals with research methods and an interdisciplinary analysis of problems in industrial relations. The faculty is drawn from a number of separate disciplines.
2. Industrial Relations 340. Thesis in Industrial Relations. I, II, S. 1-6 hr. Total minimum requirement, 6 hours.
3. A minimum of 15 hours chosen from the following courses in industrial relations after consultation with the Director of the Institute. (In general, a student should choose no more than 6 of the required 15 hours in any one subject-matter area.)

		Hr.
Economics		
217.	Trade Unionism	3
218.	Col. Barg. and Lab. Rel.	3
219.	Econ. of Wages	3
Engineering of Mines		
215.	Indust. Safety Engr.	2
History		
281.	American Lab. Movement	3
Industrial Engineering		
240.	Motion and Time Study	3
288.	Job Eval. and Wage Incent.	2
370.	Theor. Indust. Eng. and Org.	3
Law		
264.	Labor Law	3
Management		
216.	Personnel Management	3
Psychology		
214.	Job Analysis	3
244.	Personnel Psychology	3
314.	Prac. Indust. Interv.	3
Sociology		
250.	Human Rel. in Indust.	3

4. With the consent of the adviser the remaining 6 or more semester hours may be selected from the following courses:

Economics		
210.	Comp. Econ. Systems	3
211.	Macro. Econ. Anal.	3
212.	Macro. Econ. Anal.	3
235.	Econ. Growth & Fluct.	3
245.	Govt. and Business	3
256.	Advanced Statistics	3
Education		
375.	Indiv. Invt. Techn.	3
376.	Counseling Techniques	3
Journalism		
212.	Public Relations	3
Management		
225.	Business Policy	3
Industrial Engineering		
290.	Indust. Statistics	2
294.	Standard Mfg. Costs	3
Political Science		
232.	Publ. Opinion and Prop.	3
241.	Adm. Org. and Man	3
346.	Dir. Read. in Pub. Adm.	2-4

Psychology

205. Individual Differences 2
216. Attitudes and Propaganda . 3
225. Group Psychom. Testing . 3
229. Abnormal Psychology . . . 3
236. Psychology of Adjustment . 3
260. Statis. Methods of Psych. . . 3

Rehabilitation Counseling

384. Occ. and Place. 3

Social Work

285. Intro. to Publ. Welfare . . . 3
304. Community Relationships . 3
306. The Social Services 3

Sociology

220. Social Change 3
244. Culture and Personality . 3
270. Group Dynamics 3

Limited changes may be made in the curriculum outlined above, with the consent of the Director of the Institute. To be eligible for graduation, graduate students must maintain a 3.0 grade-point average (B) in all graduate courses excluding Industrial Relations 340. A grade of "D" in any course taken while a student in the industrial relations program, whether the course is graduate or undergraduate, inside or outside the program, may be grounds for failure in the program.

Thesis Requirements

The student must choose his thesis topic in consultation with the Director. After this approval has been received, the student—with the advice of the Director—shall select a thesis chairman. The student, with the aid of his thesis chairman, shall make his hypothesis and the methodology to be employed explicit.

The final draft of the thesis must be approved by the thesis committee, composed of the thesis chairman and two other faculty members. The Director of the Institute will be a member of every thesis committee; further, no more than two members of a thesis committee may represent the same discipline.

JOURNALISM

The School of Journalism offers work leading to the degree of Master of Science in Journalism.

Purpose of the Degree. The purpose of the degree is to provide the student who already has a sound background in technical and professional journalism education an opportunity to broaden his communications horizons by gaining a critical insight into the theory and practice of the communications industries; the degree also is intended to introduce the student to research methods applicable to communications problems.

Admission. In order to be admitted to the Master of Science in Journalism program, the student must have a baccalaureate degree in journalism from an accredited institution or must have completed a core program in journalism or must demonstrate competency in a minimum number of areas prescribed by the School of Journalism. The prospective student also must have had a 3.0 average in undergraduate Journalism courses.

Requirements. The student will be required to meet the following requirements for the degree:

a. Complete a minimum of 30 semester credit hours, including a thesis with a maximum of 6 hours credit.
b. At least 18 hours of work, including the thesis, must be taken in the School of Journalism.
c. A minor of 9-12 hours credit must be taken outside the School of Journalism.

Examination. On completion of course requirements, the candidate shall be required to pass an oral examination on his thesis and on his competence in his major and minor fields.

201. Interpreting Current Events. S. 1 hr. A study of national and world news developments, their backgrounds, and their meanings.

212. Public Relations. I, II, S. 3 hr. Principles, problems, and practices concerned in the relationships of businesses, industries, and nonprofit organizations with their respective publics; practice in the evaluation of existing public relations programs; and their refinement for further effectiveness.

213. Industrial Journalism. II. 2 hr. PR: Journ. 212 or consent. A study of the relations between industry and its many publics, with emphasis on internal and external company publications as public relations media. Extensive practice in planning and writing material and in page makeup for industrial publications and trade journals.

215. High School Journalism. II, S. 2 hr. A survey of scholastic publications problems and techniques; suggested methods of instruction.

220. Newspaper and Magazine Article Writing. II. 2 hr. A seminar-type course devoted to the writing, editing, and marketing of features, including reviews and critical articles.

227. History of Journalism. I, S. 3 hr. PR: Hist. 52, 53. A study of the impact of the American press on the nation; the development of today's communications media from their beginnings in 17th Century England and in the American colonies; and examination of the great names in journalism from the standpoint of their contributions to today's journalism; freedom of the press and its current implications.

230. Editorial and Law of the Press. I. 2 hr. Writing and analyzing editorials and columns; a study of the editorial page and editorial ethics, problems, and policies; a study of the vital elements of libel, privacy, contempt, and other phases of law of the press.

235. Editorial and Law of the Press. II. 2 hr. Continuation of Journ. 230.

239. Seminar in Advertising-Management Problems. I, II. 2 hr. PR: Major or minor in advertising. Current trends in advertising, merchandising, and distribution problems. Students develop individual projects in some phase of advertising or management.

241. Journalism Problems. I, II, S. 1-3 hr. For seniors and graduates. An intensive study, independently conducted, of a specialized area or problem in journalism, to be approved by the Dean.

242. Advanced Journalism Problems. I, II, S. 1-3 hr. Continuation of Journ. 241.

243. International Communications. I. 3 hr. International wire services. Coverage of world news in newspapers of the United States and foreign countries; and desirability of a free flow of information to and from the United States. United Nations efforts to lower news barriers will be examined.

301. Research Methods and Literature. I, S. 3 hr. A study of methods common to communications research; critical examination of communications literature; independent research project by each student.

302. Seminar in Communications Theory. II, S. 3 hr. Historical development of the mass media; problems of communicating with the various publics; general problems of contemporary mass media.

312. Seminar in Institutional Relations. II. 3 hr. A study of the problems of public relations and public information officers of educational institutions of higher learning and public service organizations; thorough study of the publics which these officers attempt to reach.

315. Seminar in Journalism Education. I, S. 1-3 hr. Discussion of journalism educational problems. Each student will do an individual research project planned to provide for his professional development as a teacher of journalism. Emphasis on secondary school problems.

322. Seminar in Radio-Television Problems. S. 3 hr. Investigation and discussion of current problems and practices in the field of broadcast journalism. The student and the instructor will choose a problem, or a phase of a problem, for analysis and research as the course progresses.

339. Seminar in Advanced Advertising Management Problems. II. 3 hr. Recently developed ideas and techniques in advertising, advertising research, and media management.

343. Seminar in the Foreign Press. II. 3 hr. Studies in legal and communications problems of the international flow of news and opinion; international press codes; communications media of major countries.

380. Thesis. I, II, S. 2-6 hr.

MEDICAL CENTER

The Departments of Biochemistry, Gross and Neurological Anatomy, Microbiology, Pharmacology, and Physiology each offer programs of study leading to the Master of Science and the Doctor of Philosophy degrees. The Department of Microanatomy and Organology offers studies leading to the Master of Science degree. Admission to these programs is permitted only with the approval of the department concerned. Students should contact the chairman of the major department and request permission to do graduate work well in advance of the time of registration.

Requirements for Admission to Graduate Study In the Medical Center

1. The student's undergraduate scholastic standing shall be a quality equivalent to that required for admission to the School of Medicine or School of Dentistry.
2. A transcript of the student's grades should be available to the major department at least six weeks before the beginning of the semester in which the student desires to start his graduate work. In addition, two letters of recommendation from professors in major and minor fields are desirable.
3. The student may be asked to appear in person.
4. The candidate must meet the admission requirements of the department in which he pursues his major study. Qualifying entrance examinations and/or the Graduate Record Examination may be required.
5. After acceptance and before registration, the student and his adviser shall formulate a schedule for the entire year.

Standards for Graduate Study and Requirements For the Master of Science Degree

1. No credits are acceptable toward an advanced degree which are reported with a grade lower than "C." Certain departments require the student to maintain a "B" average or that two-thirds of the credits carry a grade of "B."
2. A minimum of 30 hours of related graduate courses shall be required. Twenty hours shall be in the major field which include 6 hours credit for a thesis.
3. An examination in the major and related fields shall be given before the student can qualify for his final oral examination.
4. A thesis is required and shall represent original research by the candidate for the degree.

Requirements for the Master of Science Degree for Students Enrolled in the Schools of Medicine or Dentistry

1. Medical or Dental students shall fulfill the above requirements for admission and scholarship.
2. Students enrolled in the Schools of Medicine or Dentistry who hold a Bachelor's degree from an approved institution and desire to do additional work for the Master's degree must also register in the Graduate School.
3. Medical and dental students may count preclinical courses in basic sciences toward the Master's degree as long as they complete not fewer than 24 semester hours of graduate courses that are not required for the degrees of Doctor of Medicine or Doctor of Dental Surgery.

4. All courses offered to meet these requirements must be courses numbered between 200 and 399 that are approved by the Graduate School and listed in these *Announcements.*

5. A thesis is required.

Requirements for the Doctor of Philosophy Degree

1. The student must meet the standards of scholarship required for the Master's degree and complete or offer previous graduate credit of no less than 60 semester hours of related course work, exclusive of research or thesis. However, these 60 semester hours may include 6 hours of research or thesis credit earned for the Master's degree.

2. The residence requirements set by the Graduate School for the degree of Doctor of Philosophy must be met.

3. Students will be required to take a comprehensive preliminary or qualifying examination, language examinations, and a final examination as specified by the regulations of the Graduate School. Arrangements must be made with the major department which will determine the scope and nature (either oral or written or both) of these examinations. Also, the major department may request the Dean of the Graduate School to approve the substitution for French or German a more suitable foreign language.

4. Before admission to the final examination, the candidate must submit a thesis that presents the results of the candidate's individual investigation, demonstrates a mastery of research techniques, and represents a definite contribution to knowledge.

Requirements for the Master of Science Degree for Students Who are Doctors of Medicine or Dental Surgery

1. Such students must meet the standards of scholarship required for the Master's degree and complete not less than 30 semester hours of course work, exclusive of research or thesis, beyond that required for the professional degree.

2. The requirements, cited for the Doctor of Philosophy Degree, concerning examinations and thesis must be met.

MEDICAL CENTER COURSES OPEN TO GRADUATE STUDENTS

ANATOMY [Includes (1.) Gross and Neurological Anatomy and (2.) Microanatomy and Organology.]

201. Gross Anatomy. (With Medical Students). I and II. 12 hr. PR: General zoology and consent. A detailed study of the human body with a complete dissection.

203. Neuroanatomy. (With Medical Students) II. 4 hr. PR: Consent. A gross and microscopic study of the central nervous system.

205. Microanatomy and Organology. (With Medical Students). I. 6 hr. PR: General zoology or equiv. Structure, function and embryology of tissues and organs.

206. Gross Anatomy. (With Dental Students). I and II. 8 hr. PR: General zoology and consent. A study of the human body including dissection.

208. Neuroanatomy. (With Dental Students). II. 2 hr. PR: Consent. A gross and microscopic study of the central nervous system.

209. Microanatomy and Organology. (With Dental Students). I. 6 hr. PR: General zoology. Structure, function, and embryology of tissues and organs with emphasis on teeth and supporting structures.

301. Advanced Gross Anatomy. I, II, S. 2-6 hr. per sem. Total of 36 hr. PR: Anat. 201 and consent. A morphological and functional analysis of a selected region. With dissection.

302. Advanced Developmental Anatomy. I, II, S. 2-6 hr. per sem. Total of 18 hr. PR: Anat. 201 and consent. Detailed developmental anatomy of the fetal period and of childhood. With dissections and analysis of variations and malformations.

303. Seminar. I, II, S. 1-6 hr. PR: Consent. Selected areas of study including historical aspects.

304. Applied Anatomy. I, II. 2-6 hr. per sem. Total of 36 hr. PR: Consent. A detailed study of anatomy adapted to the needs of the individual student.

305. Experimental Embryology. II. 3 hr. PR: Biochemistry, embryology, Micro-anat. 205, and consent. An analysis of development, differentiation and regeneration.

350. Research in Gross and Neurological Anatomy. I, II, S. 1-15 hr. PR: Anat. 201, 203, and consent.

BIOCHEMISTRY

223. Biochemistry. (With Dental Students). I. 7 hr. PR: Organic Chem., consent. A study of the chemical and physiochemical processes which take place in the human body.

231. Biochemistry. (With Medical Students). I. 8 hr. PR: Organic Chem., consent. Content similar to Biochem. 223.

232. Biochemistry. (With Medical Students). II. 2 hr. PR: Biochem. 231 and consent. A continuation of Biochem. 231.

237. Seminar in Biochemistry. I, II, S. 1-6 hr. (1 hr. per sem.) PR: Biochem. 223, 231, consent. Presentation and discussion of special topics.

239. Clinical Chemical Techniques. (Primarily for Medical Technology Students). II. 4 hr. PR: Biochem. 139, 223, or 231. Open to other qualified students.

330. Biochemical Preparations. I, II, S. 2-5 hr. PR: Biochem. 223, 231 or equiv., consent. Emphasis on biochemical methods.

331. Radiobiology. II. 3 hr. PR: Biochem. 223, 231, or equiv., consent. Emphasis on nature and measurement of isotopes and their biological applications.

332. Enzyme Kinetics. II. 3 hr. PR: Biochem. 139, 223, 231, or equiv., consent. An introduction to the physical mechanisms of enzyme action.

333. Research in Biochemistry. (Available only to students fulfilling requirements for the M.S. degree.) I, II, S. 1-6 hr. PR: Biochem. 231 or equiv.

334. Special Topics. I, II, S. 1-18 hr. PR: Consent.

337. Biochemistry of the Amino Acids and Proteins. I. 3 hr. PR: Biochem. 231 or equiv., consent. Offered in 1965-66 and every third year.

338. Biochemistry of the Lipids. II. 3 hr. PR: Biochem. 231 or equiv., consent. Offered in 1964-65 and every third year.

339. Research. I, II, S. 1-15 hr.

MICROANATOMY AND ORGANOLOGY

205. Microanatomy and Organology. (For Medical Students, First Year). I. 6 hr. PR: Gen. Zool. or equiv. Structure, function, and embryology of tissues and organs.

209. Microanatomy and Organology. (For Dental Students). II. 6 hr. PR: Gen. Zool. Structure, function, and embryology of tissues and organs with emphasis on teeth and supporting structures.

305. Experimental Embryology. II. 3 hr. PR: Biochemistry, Embryol., Microanat. 205 or 209, and consent. An analysis of development, differentiation, and regeneration.

351. Advanced Microanatomy and Organology. I, II, S. 2 hr. PR: Microanat. 205 or 209 and consent. An extension of the major topics included in Microanat. 205 or 209 with special emphasis on recent contributions.

352. Research in Microanatomy and Organology. I, II, S. 2-6 hr. PR: Microanat. 351 and consent.

353. Special Topics in Microanatomy. I, II, S. 2-6 hr. PR: Microanat. 205 or 209 and consent. Detailed consideration of selected topics. Includes literature reviews, special techniques, and laboratory studies.

MICROBIOLOGY

220. Microbiology. (For Pharmacy Students and Graduate Students). II. 5 hr. PR or Conc: Organic Chem. A detailed study of pathogenic microorganisms.

221. Microbiology. (For Medical Students, Second Year and Graduate Students). I. 7 hr. PR: Organic Chem., Biochem. A detailed study of pathogenic microorganisms.

222. Parasitology. (For Medical Students, Second Year). II. 2 hr. PR: Consent. Introduction to animal organisms as human pathogens and vectors of disease.

223. Pathogenic Microbiology. (For Medical Technology Students and Graduate Students). II. 5 hr. PR or Conc: Organic Chem. A detailed study of pathogenic microorganisms.

224. Parasitology. (For Medical Technology Students and Graduate Students). II. 4 hr. PR: Consent. Study of the biology of animal parasites and their roles as agents and vectors of disease.

225. Microbiology. (For Dental Students). I. 5 hr. PR: Organic Chem. A detailed study of pathogenic microorganisms.

226. Basic Microbiology. (For Graduate Students). I. 4 hr. PR: Organic Chem.; Biology recommended; consent. A detailed review of the major groups of microorganisms including morphology and physiology.

227. Special Problems in Microbiology. I, II, S. 1-6 hr. per sem. with a total of 24 hr. available. PR: Microbiol. 226 or equiv.

228. Diagnostic or Determinitive Microbiology. I, II, S. 1-6 hr. per sem. with a total of 24 hr. available. PR: Microbiol. 226 or equiv. Diagnostic procedures as aids to diagnosis of human diseases and methods for the identification of microorganisms.

321. Bacterial Physiology. I. 3-4 hr. (lect. 3 hr. with lab. 4 hr.) PR: Microbiol. 226 or equiv.; Organic Chem.; Biochem. or Conc. Physiological studies on bacteria including nutrition, metabolic pathways, growth and death.

322. Microbial Genetics and Cytology. II. 4 hr. PR: Microbiol. 226 or equiv.; consent. Principles of microbial genetics and advanced cytological techniques.

323. Immunology. II. 4 hr. PR: Microbiol. 226 or equiv. A thorough study of antigens, antibodies, and their reactions both in vitro and in vivo and including the hypersensitivity phenomenon.

324. Virology. II. 4 hr. PR: Microbiol. 226 or equiv. A comprehensive study of human, animal, and bacterial viruses.

325. Medical Mycology. I. 3 hr. PR: Microbiol. 226 or equiv.; Mycology 203 and 330 are recommended. A study of the fungi which infect humans with the emphasis on isolation and identification.

326. Seminar. I, II, S. 1-6 hr. PR: Microbiol. 226 or equiv. This will include the history of microbiology.

327. Research in Microbiology. I, II, S. 1-15 hr. PR: Microbiol. 226 or equiv.

PATHOLOGY

228. Pathology. (With Dental students). II. 4 hr. PR: Consent, Microscopic Anat. 209. A study of disease processes with emphasis upon fundamentals.

256. Advanced Pathology. I, II. 3 hr. PR: Consent, Path. 228. Microscopic and gross specimens from selected autopsies.

351. Research. I, II. 1-6 hr. PR: Consent.

PHARMACOLOGY

60. Pharmacology. II. 3 hr. (For students in the Paramedical Sciences). Physiology, chemistry, pharmacodynamics, toxicology, and therapeutic use of drugs as used in nursing practice.

260. Pharmacology. (For Dental Students). I. 5 hr. PR: Physiology. Chemistry, pharmacodynamics, toxicology, and therapeutic use of drugs.

261. Fundamentals of Pharmacology. (For Pharmacy Students). I. 5 hr. PR: Physiology. Classification, pharmacodynamics, and toxicology of therapeutic agents.

262. Pharmacology. (For Medical Students, Second Year). II. 6 hr. PR: Physiology. Chemistry, pharmacodynamics, toxicology, and therapeutic use of drugs.

265. Seminar in Pharmacology. I, II. 1 hr. per sem. PR or conc: Pharmacol. 262 or graduate status in basic medical sciences.

360. Special Topics in Pharmacology. I, II, S. 1-6 hr. per sem. Assigned study in pharmacodynamics, autonomic and cardiovascular pharmacology, chemotherapy, bioassay, and the biochemistry of drug action.

362. Advanced Pharmacology. I, II, S. 1-6 hr. per sem. PR: Pharmacol. 262 or equiv. Lectures and laboratory study in advanced phases of pharmacology; development of research techniques.

367. Research in Pharmacology. I, II, S. 1-16 hr. per sem. PR: Pharmacol. 262 or equiv.

PHYSIOLOGY

241. Human Physiology. (With Medical Students). II. 9 hr. PR: Comparative anatomy, Biochem. 231. A study of the functions of organs.

243. Human Physiology. (With Dental Students). I. 6 hr. PR: General zoology, organic chemistry. Normal functions of the body with emphasis on aspects pertaining to dentistry.

244. Seminar in Physiology. I, II. 1-6 hr. (1 hr. per sem.). PR: Graduate status.

340. Special Topics. I, II, S. 1-12 hr.

342. Advanced Physiology. I, II, S. 1-6 hr. per sem. PR: Physiol. 241 or 243 or equiv. Historical review, discussion of latest developments.

344. Physiology. Introduction to Biophysics. S. 2 hr. PR: Biol. 2 or Zool. 2; College Algebra.

346. Research in Physiology. I, II, S. 1-12 hr.

MEDICINE

223. History of Medicine. (With Medical Students). I. 1 hr. A brief history of the development of the art and science of medicine.

272. Organic Pharmaceutical Chemistry. I. 3 hr. PR: Biochem. 139 and Pharm. 142. A study of the modern synthetic drugs and natural products, with regard to nomenclature, methods of synthesis and relation to other drugs having similar therapeutic, physical and chemical properties. (45 hr.)

273. Organic Pharmaceutical Chemistry. II. 3 hr. PR: Pharm. 272. A continuation of Pharm. 272. (45 hr.)

274. Assay and Pharmaceutical Testing. II. 3 hr. PR. Pharm. 201 and 272. Application of basic scientific principles to the standardization and analysis of drugs and pharmaceutical products, with particular attention to newer analytical techniques. Lectures and laboratory. (105 hr.)

PHYSICAL AND HEALTH EDUCATION, RECREATION, AND SAFETY

The School of Physical and Health Education, Recreation, and Safety offers courses leading to the Master of Science degree, with an emphasis in Health and Safety Education, Physical Education, or Recreation—or combinations of all three areas.

Students are admitted for graduate work in the School of Physical and Health Education, Recreation, and Safety provided they hold a baccalaureate degree from an approved college; have a 2.5 grade-point index for the work completed in their junior and senior undergraduate years; and satisfy prerequisites in the courses for which they register.

Students who do not meet the 2.5 grade-point average requirement may be admitted on probation and will be required to earn a 3.00 average in the first 12 semester hours of residence work in order to continue.

Students are accepted as advanced degree candidates on the basis of a preliminary qualifying examination following one semester, or two summer terms, (12 semester hours)* of graduate residence work provided they:

A. Are certified to teach physical education; or have at least 24 semester hours, or its equivalent** which is an undergraduate minor in either physical education, health and safety education, recreation, or a combination in these areas. The equivalent is determined by the Committee on Graduate Courses.
B. Demonstrate to the satisfaction of the Committee on Graduate Study by a Preliminary Comprehensive Examination, taken after completing 12 hours in residence, a grasp of the important phases and problems in the single interest area.

Admission to the Graduate School

Students who wish to enter the Graduate School file application for admission with the Director of Admissions of the University, who will forward the application to the Dean of the Graduate School. The applicant must request the registrar of the college or university previously attended to send an official transcript directly to the Director of Admissions at least one month in advance of registration days. Application forms may be obtained from the Director of Admissions of the University.

*Courses taken in University Extension are accepted for degree purposes provided the student has had prior approval from his adviser.

**Experience in teaching Health, Physical Education, and Recreation Leadership, and coaching experience may be evaluated by special examination to adjust some of the undergraduate requirements.

Admission to Graduate School does not constitute admission to candidacy for the Master of Science degree. The Dean of the Graduate School and the graduate adviser in the School of Physical and Health Education, Recreation, and Safety will advise the student concerning departmental prerequisites and advanced degree requirements.†

The Degree of Master of Science

Thirty-six semester hours are required for the Master of Science degree, distributed as follows:

I. A *minimum* of 24 semester hours in the areas of Health Education, Physical Education, Recreation, and/or Safety Education, of which:
   A. 15 semester hours must be in a single interest area;‡ including the basic course, (Health Educ. 205 or Phys. Educ. 294, or Rec. 202, or Safety Educ. 283 and "Introduction to Research," HPERS 375).
   B. 3 semester hours in each of two allied areas: Health Educ. 205, Phys. Educ. 294, Rec. 202, *OR* Safety Educ. 283.

II. A minimum of 6 semester hours of approved course work in related areas other than Health Education, Physical Education, Recreation, and Safety Education.

III. Nine semester hours of electives in the specialized or related areas.

IV. Six semester hours may be earned for the writing of a thesis; or 3 semester hours may be earned for the writing of a problem.

V. A minimum of 12 semester hours must be in courses numbered 300 and above, 9 of which must be in the single interest area.

VI. Degree candidates must have a 3.00 grade-point average for graduation.

VII. Degree candidates must successfully pass the comprehensive examination which will include philosophy in the single interest area and two allied areas; measurement and evaluation; and research methodology.

Certificate of Advanced Study

The program, in cooperation with the College of Education, is designed to prepare school and related personnel who wish professional training beyond the Master's degree. Candidates for this Certificate may choose from among the following areas of study for their specialization: Physical Education, Health, and Safety Education.

Prerequisites to Admission to the Program

1. General requirements for admission to the Graduate School of West Virginia University.
2. A Master's degree with a grade-point average of 3.0 or higher.
3. A minimum of three years of teaching or closely related educational experience.

Requirements for Admission to Candidacy

1. Evidence through examination, personal letter, and personal interview of general proficiency, acceptable standards of oral and written communication, and good health.
2. Satisfactory completion *in residence* at West Virginia University of at least six semester hours of approved course work beyond the conferring of the Master's degree.

Requirements for Completion

The Program: An approved program consisting of a minimum of 30 semester hours earned above the Master's degree of which 24 semester hours will be course work in Education and closely related fields and six hours of research.

At least 24 semester hours of the work credited for this Certificate must be done in residence at West Virginia University. This requirement includes the six hours

†As of September, 1962 all entering graduate students must take the Graduate Record Examnation General Aptitude test and the Advanced Physical Education test.

‡Health Education and Safety Education are considered a single area.

of research which may be conducted apart from the physical limits of the University but must be done under the direction and supervision of the chairman of the student's graduate committee. A maximum of six semester hours earned in residence at another approved graduate institution or in West Virginia University Extension may, if approved by the student's adviser, be allowed toward credit for the Certificate.

Final Examination(s): Upon completion of all requirements including the research report, the candidate will be admitted to a final oral examination by his graduate committee.

Time Limitation: All requirements must be completed within seven calendar years immediately preceding the awarding of the Certificate.

The Degree of Doctor of Education

The degree of Doctor of Education is offered in cooperation with the College of Education. Admission to the Graduate School and enrollment in graduate courses do not themselves imply acceptance of the applicant for a Doctor of Education degree. The sequence of prerequisites to admission, prerequisites to candidacy, and requirements for the degree are as follows.

Admission into the Doctoral Program

Applicants expressing a desire to pursue a program leading to the Doctor of Education degree are required to satisfy a College of Education faculty Committee on Prerequisites in the following ways:

A. Furnish evidence of three or more years of successful teaching and/or closely related experience.

B. Hold a Master's degree or its equivalent with a grade-point average of 3.0 or higher.

C. Submit evidence of satisfactory performance on Graduate Record Examination.

D. Demonstrate, by means of selected oral and written tests, ability to under take a doctoral program of study and research.

E. Complete, in a satisfactory manner, if required, a trial period of resident study.

Doctoral Committee

When an applicant has received the permission of the Graduate School to enter an organized program of advanced graduate study and research, he will be assigned an adviser by the Dean of the College of Education. The Dean of the Graduate School and the adviser will jointly select a doctoral committee consisting of five or more members, of whom at least one shall be from a field other than Education. For applicants of the cooperating schools, colleges, and departments, two of the five members shall be selected from the student's major discipline, one of whom shall serve as co-chairman. This committee will be appointed immediately following the successful completion of the screening examination.

The adviser shall serve as chairman of the doctoral committee, and this committee shall have charge and direction of the applicant's program. This program, prepared by the adviser and the applicant prior to the completion of twelve hours of resident course work beyond the Master's degree, must be approved by the doctoral committee and by the Dean of the Graduate School.

Requirements for Completion

Curriculum. The exact amount and nature of course work to be undertaken by a candidate will be determined in the light of his previous preparation and the demands of his chosen field of application. The aggregate of courses of graduate study shall be 70 or more semester hours, exclusive of the dissertation, of which a minimum of one-half of the semester hours in Education and one-third of the semester hours in cognate courses shall be on the 300 level. Not more than 12 of the 70 hours may be earned in extension and/or practicum or field work. The program of course work shall include a minimum of 24 semester hours in professional Education and a minimum of 24 semester hours in courses other than professional Education. These

courses shall be so ordered and distributed as to promote broad and systematic knowledge and the ability to conduct independent research. Course work taken at another institution, if of suitable character and quality, may be accepted at the discretion of the Doctoral Committee.

Candidates having an earlier graduate degree or its equivalent from West Virginia University will be required to complete a prescribed number of resident graduate hours in one or more other institutions.

Qualifying Examination. After the applicant has spent at least one semester, or its equivalent, in full-time residence study beyond the successful completion of the screening examination, he will be eligible for the written and oral qualifying examinations, scheduled and conducted by the Chairman of the Graduate Committee, in the areas of general professional education, specialization, and cognates.

The applicant must: (a) show satisfactory knowledge of the important phases and problems of the field of major study and their application to other fields of human knowledge and accomplishment; (b) demonstrate the ability to employ rationally the appropriate instruments of research; and (c) present a written tentative outline of a proposed research project.

After successful completion of the written qualifying examination, the oral portion of the qualifying examination is scheduled within a reasonable time. If the committee is not satisfied with the applicant's performance, it will make specific recommendations for additional work in preparation for a second examination that may be undertaken not earlier than six months nor later than twelve months after the first trial. The outcome of the second attempt will be considered final.

When the applicant has passed the written and oral qualifying examinations, he will be admitted to candidacy for the Doctor of Education degree. Admission to candidacy must precede the final examination by at least one academic year in time and 12 semester hours in credit. A maximum of 30 semester hours of graduate work pursued in fulfillment of the requirements for the Master's degree or its equivalent, if of suitable character and quality, may be credited toward the doctorate.

Residence. In general, requirements for the Doctor of Education degree contemplate three years of full-time graduate work beyond the Bachelor's degree, including a minimum of two semesters in residence in full-time graduate study in West Virginia University beyond the Master's degree or its equivalent.

Special Requirements. In addition to general curriculum requirements, candidates must demonstrate competence in the techniques of statistical research, evidence of a functioning command of appropriate methods of educational investigations, and mastery of the rules of manuscript preparation.

Dissertation. The candidate must submit a dissertation, pursued under direction of his doctoral committee, on a problem in the field of his major interest. The dissertation must show familiarity with previous research in the general area of the problem; embody a clear definition of the particular problem pursued; employ valid methods of research; demonstrate the ability to create and evaluate new knowledge; present and interpret unequivocally the results of the candidate's individual investigation; and disclose his ability to apply his contribution to the solution of educational problems. The final copy of the dissertation must be approved by a designated member of the University Department of English.

Final Examination. If the candidate's dissertation is approved and he has fulfilled all other requirements, he will be admitted to the final oral examination before his committee. At the option of his committee a written examination also may be required. The final examination or examinations shall be concerned with the dissertation, its contribution to knowledge, and the candidate's grasp of his field of specialization, and its relation to other fields. No candidate may proceed to his final examination until he has fulfilled residence requirements for the degree and until he has completed at least 12 semester hours of graduate study after admission to candidacy.

Time Limitation. Requirements for the Doctor of Education degree must be completed within seven years after successful completion of the preliminary examination of the College of Education. (Effective September, 1963).

HEALTH EDUCATION

201. Advanced School Health. I, S. 3 hr. PR: Health Educ. 101, 20 hr. of Education, or consent. An analysis of problems in school health services, healthful school living, the nature of health education, and the scope of health instruction which confronts teachers and administrators.

205. Philosophy of Health Education. I, S. 3 hr. PR: Health Educ. 2, and 101, or equiv. Analysis of the scientific bases, purposes, procedures, and content, with implications for school and public health education programs.

301. Community Health. II, S. 3 hr. PR: Health Educ. 2, and 205, or equiv. Health problems requiring community action, basic public health activities, community organization for health protection, voluntary health agencies, school health programs, and the role of state and federal agencies in the community health program.

376. Evaluation of Health Information. I, S. 3 hr. PR: Health Educ. 2, and 201, or 20 hr. of Education and consent. Study of published material to determine basic scientific accuracy and value.

394. Seminar in Health Education. I, II, S. 4 hr. PR: Health Educ. 205. An overview and critical analysis of the literature and research in health education.

397. Individual Research Problems in Health Education. I, II, S. 1-4 hr. PR: Minimum of 6 sem. hr. in Health Educ., including Health Educ. 205, and HPERS* 375 or 395, or Educ. 301. Oportunity for independent study and investigation of pertinent problems. For advanced students with practical experience.

398. Practicum in Health Education. I, II, S. 4 hr. PR: Health Educ. 394, and HPERS 396 and 397. Program planning, curriculum development and job functions in health education.

PHYSICAL EDUCATION

206. Program in Individual Sports. S. 3 hr. PR: Phys. Educ. 51, 55, 56, 155 or equiv. Designed for coaches of interscholastic athletics. A study of advanced coaching techniques and methods in track and field activities, wrestling, and gymnastics.

207. Program in Team Sports. S. 3 hr. PR: Phys. Educ. 51, 55, 56, 155, or equiv. Designed for coaches of intercollegiate athletics. A study of advanced techniques, systems of play, offense, defense, methodology, staff organization, and related problems in the coaching of football, basketball, and baseball.

208. Advanced Athletic Training and Conditioning. I, S. 3 hr. PR: Phys. Educ. 121, 175; Zool. 171, or equiv. To acquaint graduate students with recent theories, practices, and techniques in the prevention, care, and treatment of athletic injuries.

209. Officiating Football and Basketball. I, S. 2 hr. Rules and techniques of officiating, officials' organizations, and laboratory work.

210. Program in Sports. S. 3 hr. (W). PR: Phys. Educ. 31, 32, or equiv. Designed especially for women engaged in teaching and coaching. Organization and administration of individual, dual, and team sports. Practicum in girls' and women's sports.

211. Organization and Administration of Intramural Sports. I, S. 3 hr. PR: 4 hr. of physical education activity courses. Critical analysis with view to justification from standpoint of objectives and of contribution to general welfare of students participating. Organization and administration of programs on secondary and college levels.

212. Extracurricular Physical Education Activities for Secondary School Girls. I, S. 3 hr. PR: Consent. Critical analysis of physical education extracurricular activities from the standpoint of objectives and contributions to the general welfare of the participants; value of the activities in the school and community; relationship to the physical education program; problems associated with the organization and administration of the program.

213. Administration of Athletics. S. 3 hr. PR: Experience in coaching and administration. The course is designed for persons engaged in actual coaching

and administration. A study of the problems associated with the organization and administration of interscholastic and intercollegiate athletic programs and their relationship to physical education.

215. Rhythms and Dance. II, S. 3 hr. PR: Consent. Principles of movement, materials, and practicum in dance.

219. Modern Dance Techniques and Composition. I, S. 3 hr. PR: Phys. Educ. 35 and 36 or consent. Application of scientific principles of movement; basic principles of music as related to dance movement; choreographic principles; practicum in dance movement. Principles for teaching the dance and problems involved in planning programs.

275. Principles and Practices of Adapted Physical Education. I, S. 3 hr. PR: Zool. 171, Phys. Educ. 175, or equiv. Principles and philosophy in building an adapted program, types of injuries, classification of students, and application of adapted exercises.

278. Administration of Physical Education. II, S. 3 hr. PR: Phys. Educ. 71, 177. Modern theories in physical education and guiding principles in organization and administration of the program.

292. Physical Education in the Elementary School. I, S. 3 hr. PR: Teaching experience or consent. Philosophy, objectives, activities, equipment, utilization of space, program planning, and evaluation for a functional program in elementary school physical education.

294. Philosophy of Physical Education. I, II, S. 3 hr. PR: Phys. Educ. 177 and 278 or equiv. and consent. Study of the place of physical education in education and modern living; philosophic processes in physical education; critical analysis of various problems confronting the physical educator.

295. Residence in Corrective Therapy. S. 6 hr. PR: Phys. Educ. 175, 176, and selected phychology courses. An intensive 6-week course offered during the Summer under the auspices of the professional staff of a hospital. The course consists of 240 clock hours of staff lectures and practical clinical experience in corrective therapy as it is integrated in the Physical Medicine and Rehabilitation Program of a hospital.

319. History and Philosophy of the Dance. II, S. 3 hr. PR: Phys. Educ. 219 or equiv. A cultural survey of the dance as an expression of the society it represents; philosophy of the dance; the relation of dance to other art forms; dance as an educational experience and the study of the works of the outstanding artists of today.

380. Curriculum Development in Physical Education. S. 3 hr. PR: Phys. Educ. 294. Application of principles of growth and development of various age groups to program planning in physical education; evaluation of activities; formulation of criteria as a basis for curriculum revision to meet changing needs in the school program. (Limited to major students.)

394. Seminar in Physical Education. I, II, S. 4 hr. PR: Phys. Educ. 294. An overview and critical analysis of the literature and research in physical education.

397. Individual Research Problems in Physical Education. I, II, S. 1-4 hr. PR: Minimum of 6 sem. hr. in Phys. Educ., including Phys. Educ. 294, and HPERS 375 or 395; or Educ. 301. Opportunity for independent study and investigation of pertinent problems. For advanced students with practical experience.

398. Practicum in Physical Education. I, II, S. 4 hr. PR: Phys. Educ. 394, and HPERS 396 and 397. Program planning, curriculum development, and job functions in physical education.

RECREATION

202. Philosophy of Recreation. II, S. 3 hr. PR: Major students in Recreation, Forestry, graduate students in Education and Physical Education; or consent.

Interpretation of recreation as a basic part of the living process; importance to individual community, and national welfare; social and economic significance.

204. Recreation Hobbies. I, S. 2 hr. PR: Rec. 1 or equiv. Lecture and workshop. Value of hobbies to youth and adults; participation in various types of hobbies; methods of organization and presentation; nature and scope.

206. Social Recreation for School-Age Groups. II, S. 3 hr. PR: 12 hr. in Education or consent. Workshop course. Planning and conduct of social activities, parties, picnics, special events and other recreation experience adapted to home, church, school, and community.

265. Leisure and Recreation. I, S. 3 hr. PR: Physical Education, Forestry, Recreation majors or 14 hr. in Education or consent. Study of leisure as a social phenomenon in our modern culture and its implications for recreation.

271. Administration of Camps and Preparation of Camp Counselors. II, S. 3 hr. PR: Rec. 11 or equiv. or consent. Principles involved in modern camping programs; organization and administration of camps.

282. Administration of Recreation. I, S. 3 hr. PR: Major in Recreation, Forestry, graduate status in Education or Physical Education, or consent. General principles of administration; organization of staff administrative procedures. Study of enabling laws, legal responsibilities, surveys, finance, programs, facilities, and public relations.

290. Outdoor Education and School Camping. 3 hr. PR: For majors in Education, Recreation, Extension, and Forestry, or consent. Course designed to meet the needs of schools, colleges, and other education and conservation agencies interested in developing outdoor education programs. Emphasis is upon interpretation and programming of the Outdoor Education concept.

293. Outdoor Recreation in Our Modern Society. 3 hr. PR: For persons in fields of recreation, park, outdoor education and conservation, or consent. Interpretation as to what it is, what people do, where they go, how this affects our economic, social, and cultural life, and significant trends.

296. American Folk Dance. I, S. 3 hr. PR: Phys. Educ. 132 or equiv. Study of American Square, contra, circle, and round dances and play party games, and their place in community and school recreation programs. Their origin and relationship to the arts and other aspects of American culture. Analysis of techniques in leading and calling.

305. Human Interest Areas in Recreation Planning. I, II, S. 3 hr. PR: Rec. 202 or 20 hr. in Education or equiv. Exploration of the human interest areas which are the sources of recreation program content. Their adaptation to school and municipal recreation program planning.

306. Leadership in School-Age Recreation Programs. II, S. 2 hr. PR: Rec. 107 or two years' teaching experience. Leadership techniques used in various recreation activities of school-age groups. Analysis of differences between teaching and recreation leadership.

307. Community Recreation. I, S. 3 hr. PR: Rec. 202 or consent. A study of problems related to the provision of adequate recreation service for a community. Standards and quality of recreation service; methods of measuring existing services and their coordination; and community organization procedures. Course is designed for leaders in voluntary agencies, schools, churches, and municipal recreation organizations.

394. Seminar in Recreation. I, II, S. 4 hr. PR: Rec. 202. An overview and critical analysis of the literature and research in recreation.

397. Individual Research Problems in Recreation. I, II, S. 1-4 hr. PR: Minimum of 6 sem. hr. in Recreation, including, Rec. 202 or 265; HPERS 375 or 395, or Educ. 301. Opportunity for independent study and investigation of pertinent problems. For advanced students with practical experience.

398. Practicum in Recreation. I, II, S. 4 hr. PR: Rec. 394, HPERS 396 and 397. Program planning, curriculum development, and job functions in recreation.

SAFETY EDUCATION

280. Programs in Safety Education. I, II, S. 3 hr. PR: Consent. Planning programs, methods and materials for offering instructional programs in safe living in school, home, travel, industry, physical education, athletics, and recreation.

281. Driver and Traffic Safety Education Programs. II, S. 3 hr. PR: Safety Educ. 280 or equiv., or 20 hr. of Education. Philosophy, objectives, new and advanced equipment, methods and materials in driver and traffic safety education; program planning, and evaluative techniques in schools and adult programs. Includes laboratory with various methods, materials, and instructional techniques.

282. Problems in Driver and Traffic Safety Education. I, II, S. 3 hr. PR: Safety Educ. 281 or equiv. or teaching experience in driver education. An advanced course which gives consideration to individual problems encountered in teaching driver and traffic safety education. Examination of existing courses of study, research and supervisory and evaluative practices.

283. Philosophy of Safety Education. I, II, S. 3 hr. PR: Safety Educ. 280, 281, or 20 hr. of Education. Study of the place of safety education in modern living; philosophies of safety education as expounded by leaders in the field; emphasis on accident causation and accident prevention in various areas of safety; and research implications.

365. Organization, Administration, and Supervision of School Safety Education. I, II, S. 3 hr. PR: 20 hr. of Education or Safety Educ. 280 or 283 or equiv., and consent. Designed for teachers, school administrators, college instructors, and others responsible for directing or supervising safety programs in the school. Deals with the problems, policies, practices, and procedures involved in the organization, administration, and supervision of a comprehensive accident prevention and safety education program for the school. Considers integration factors of the school safety program with the community safety program.

394. Seminar in Safety Education. I, II, S. 4 hr. PR: Safety Educ. 283. An overview and critical analysis of the literature and research in safety education.

397. Individual Research Problems in Safety Education. I, II, S. 1-4 hr. PR: Minimum of 6 sem. hr. in Safety Educ., including Safety Educ. 283, HPERS 375 or 395, or Educ. 301. Opportunity for independent study and investigation of pertinent problems. For advanced students with practical experience.

398. Practicum in Safety Education. I, II, S. 4 hr. PR: Safety Educ. 394, and HPERS 396 and 397. Program planning, curriculum development, and job functions in safety education.

HPERS

HPERS courses involve all areas — Health Education, Physical Education, Recreation, and Safety Education.

200. Workshop. 1-6 hr.

I. Health Education
II. Physical Education
III. Recreation
IV. Safety Education

201. Seminar of Foreign Programs in Health, Physical Education, Recreation and Safety. S. 2-6 hr. PR: Consent. Study of health, physical education, recreation, athletics, and safety programs as they exist in the countries

visited will be made in terms of philosophy, program content, facilities, administration. This course is designed for administrators and teachers.

301. The Role of the School Administrator in Conducting Programs in Health, Physical Education, Recreation, and Safety. S. 2 hr. PR: 20 hr. in Education. A seminar for school administrators on the solution of problems associated with planning, scheduling and conducting school programs in health, physical education, recreation, and safety. Consideration is given to program, activity, leadership, facilities, supplies, equipment, finances, and supervision. (Not open to major students.)

350. Measurement in Health, Physical Education, and Safety. II, S. 3 hr. PR: Health Educ. 205 or Phys. Educ. 294 or Safety Educ. 283. An analysis of the construction and use of typical tests in Health Education, Physical Education, and Safety Education with basic statistical interpretations.

352. Statistical Analysis in Health, Physical Education, Recreation, and Safety. II, S. 3 hr. PR: HPERS 350. A critical statistical analysis of measurement and evaluation in Health, Physical Education, Recreation, and Safety Education programming and research.

355. Problems in Health, Physical Education, Recreation, and Safety. I, S. 3 hr. PR: Health Educ. 205 or Phys. Educ. 294 or Rec. 202 or Safety Educ. 283. Content and relationships among physical education, health education, recreation, and safety programs. Aims to develop critical analysis. Follows seminar procedure and presupposes broad academic experience on part of the student.

375. Introduction to Research. II, S. 3 hr. PR: Health Educ. 205 or Phys. Educ. 294 or Rec. 202 or Safety Educ. 283. An analysis of the nature and purpose of research with an emphasis upon types and techniques applicable to the areas of health, physical education, recreation, and safety. (Required of all Master of Science degree candidates.)

395. Research Seminar. II, S. 3 hr. PR: Health Educ. 394 or Phys. Educ. 394 or Rec. 394 or Safety Educ. 394 and HPERS 375 or Educ. 301. Analysis of research design, compilation, organization, treatment and interpretation of data for research projects in health, physical education, recreation and safety. (Required of all candidates for the Doctoral Degree.)

395. Administration Policies. I, II, S. 3 hr. PR: Health Educ. 394 or Phys. Educ. 394 or Rec. 394 or Safety Educ. 394, and Educ. 339 or Educ. 340. A study and evaluation of administrative policies and practices in health education, physical education, recreation, safety education, and athletics.

397. Supervision. I, II, S. 3 hr. PR: HPERS 396 and Educ. 336 or Educ. 335 or Educ. 341. A study and evaluation of supervisory policies, practices, and techniques in health education, physical education, recreation, safety education.

399. Thesis. I, II, S. 6 hr. PR: HPERS 375 or 395.

REHABILITATION COUNSELING

The Department of Rehabiliation Counseling provides graduate professional education for counseling in rehabilitation. The College of Arts and Sciences through its Departments of Psychology and Social Work, and the Guidance Department of the College of Education cooperate in the interdepartmental curriculum.

Graduates are prepared to enter private and public agencies and facilities providing services to handicapped persons.

Scholarships and Educational Stipends

For graduate students in Rehabilitation Counseling a limited number of financial grants are available. These amount to $1,800 plus tuition for the first year of graduate study, and $2,000 plus tuition for the second year. Inquiries concerning financial assistance should be made to the Department Chairman.

Requirements for Admission

The applicant must meet admission requirements of the Graduate School and the Program Admission Committee. The applicants must bring a broad liberal arts training including no fewer than 24 semester hours, or the equivalent, in Economics, Education, History, Philosophy, Political Science, pre-Social Work, Psychology or Sociology. There must be a concentration of at least 12 semester hours in one of these fields.

Requirements for Completion

1. Completion of an approved program totaling not fewer than 42 semester hours. In most cases the program will range between 42 and 48 hours.
2. Completion of 10 to 12 semester hours of supervised clinical practice (internship) under faculty direction in a rehabilitation setting.
3. Demonstration of competence in the theory and practice of rehabilitation counseling.

The degree will not be awarded solely for credits earned. A thesis is not required.

Curriculum

The minimum curriculum in each area is set out below, allowing flexibility for adaptation to student backgrounds. Courses may be selected by the student with the consent of the adviser.

	Hr.
1. Counseling (Minimum: 6 semester hours)	
Education 376—Counseling Techniques	2
Education 377—Special Counseling Problems	3
Psychology 314—Practicum in Industrial Interviewing	3
Social Work 301—Casework I	3
Rehabilitation 390—Counseling Practicum	3
2. Evaluative Techniques (Minimum 5 semester hours)	
Education 375—Individual Inventory Techniques	2
Psychology 225—Group Psychometric Testing	3
Psychology 324—Individual Intelligence Testing	4
Education 324—Administration of Individual Intelligence Tests	4
3. Occupational Information (Minimum 2 semester hours)	
R. C. 384—Seminar in Personnel Vocational Counseling Aspects	3
Psychology 214—Job Analysis	3
4. Dynamics of Human Behavior (Minimum 6 semester hours)	
Education 378—Advanced Studies of Human Adjustment	2
Psychology 218—Psychology of Personality	3
Psychology 229—Abnormal Psychology	3
Psychology 236—Psychology of Adjustment	3
Psychology 238—Introduction to Clinical Psychology	2
Sociology 244—Culture and Personality	3
5. Community Organization: (Minimum 3 semester hours)	
Sociology 208—The Community	3
Social Work 214—Social Services in Secondary Settings	3
6. Rehabilitation Counseling (Minimum 13 semester hours)	

Rehabilitation Counseling

370. Seminar in Medical Vocational Aspects. I. 3 hr. PR: 21 hr. in social sciences or education. Contribution of medicine in the rehabilitation process from referral to vocational placement of handicapped persons.

384. Seminar in Occupations and Placement. I, II. 3 hr. PR: 21 hr. in social sciences or education. A study of occupational theory, placement, process, personnel practices, job evaluation, and medicolegal aspects of work as they pertain to rehabilitation.

386. Special Problems. II, S. 1-3 hr. Rehabilitation in theory and techniques in problems such as blindness, epilepsy, and mental retardation. Course also provides for concentrated study in special institutes.

387. Clinical Practice. I, II, S. 1-12 hr. PR: Consent, following at least one academic semester in classroom. Clinical practice (internship) in selected agencies, rehabilitation centers, clinics, or hospitals conducting an organized program of services for the mentally or physically handicapped. Such practice will be under the direct supervision of faculty and agency personnel.

388. Introduction to Vocational Rehabilitation. I. 3 hr. A study of problem and extent of disablement, historical development and legal basis, concepts, processes, and case development techniques in vocational rehabilitation as a public service to the mentally and physically handicapped.

389. Seminar. I, II, S. 1 hr. PR: Minimum of 5 semester hours of clinical practice. Course is designed to provide opportunity for critical study in selected areas in light of clinical practice experience. The professional responsibility of the counselor is covered.

390. Counseling Practicum. I, II, S. 3 hr. PR: Graduate standing and consent. Counseling techniques dealing with the theory and practice of rehabilitation counseling.

391. Directed Study and Research. I, II, S. 1-3 hr. PR: Consent. Directed reading and/or research in special rehabilitation areas.

Elective hours may be selected from the departmental offerings above, or upon recommendation of the adviser from Economics, Genetics, Management, Nursing, Education, Political Science, Sociology, Speech, and others.

BEQUESTS FOR WEST VIRGINIA UNIVERSITY

SUGGESTED FORMS

Inquiries concerning bequests or other gifts to The Board of Governors of West Virginia University, or to The West Virginia University Foundation, Incorporated, should be addressed to the Office of the President, West Virginia University, Administration Building, Morgantown, West Virginia.

The following are suggested as appropriate forms for bequests to The Board of Governors of West Virginia University:

General

I give and bequeath to THE BOARD OF GOVERNORS OF WEST VIRGINIA UNIVERSITY, a corporation existing under the laws of the State of West Virginia, the sum of ..... Dollars to be used for the general purposes of The University at the discretion of The Board of Governors.

Specific

I give and bequeath to THE BOARD OF GOVERNORS OF WEST VIRGINIA UNIVERSITY, a corporation existing under the laws of the State of West Virginia, the sum of ..... Dollars and direct that the income therefrom shall be used for the following purpose or purposes:

(Here specify in detail the purpose or purposes.)

The following are suggested as appropriate forms for bequests to The West Virginia University Foundation, Incorporated:

General

I give and bequeath to THE WEST VIRGINIA UNIVERSITY FOUNDATION, INCORPORATED, a corporation existing under the laws of the State of West Virginia, the sum of ..... Dollars to be used for general purposes of The University at the discretion of the Foundation.

Specific

I give and bequeath to THE WEST VIRGINIA UNIVERSITY FOUNDATION, INCORPORATED, a corporation existing under the laws of the State of West Virginia, the sum of ..... Dollars and direct that the income therefrom shall be used for the following purpose or purposes:

(Here specify in detail the purpose or purposes.)

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